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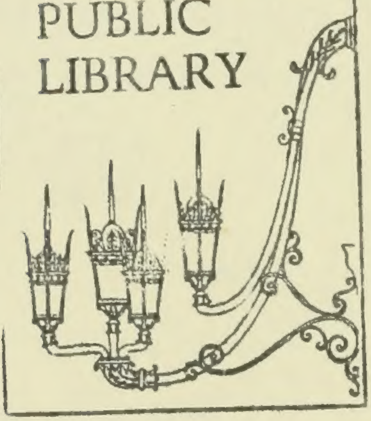

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Final Project Impact Report

Building View From Commonwealth Avenue

Submitted To:
Boston Redevelopment Authority

Proponent:
Boston University

Prepared By:
Fort Point Associates
M/V Chelsea
300 Congress Street
Boston, MA 02210'

September 1993

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1.0 PROJECT SUMMARY

1.0 PROJECT SUMMARY

1.1 PROJECT NAME

Boston University - School of Management
595 Commonwealth Avenue
Boston, Massachusetts 02215

1.2 SUMMARY PROJECT DESCRIPTION

Boston University (the University) had originally proposed to build a new School of Management project (the Project) consisting of ten stories, containing approximately 366,000 square feet with an estimated cost of $80 million. In response to concerns about visual impacts expressed through the various City of Boston and community review processes, the University has developed and agreed to a lesser scale building alternative. The alternative has reduced the gross square footage by 11%, reduced the building height over 18 feet, and reduced the Floor Area Ratio (FAR) to 6.5. The comparison between the two building alternatives is included throughout this Final Project Impact Report.

The lesser scale Project is estimated to cost approximately $75 million. The Project includes a nine story building located at 595 Commonwealth Avenue containing approximately 321,700 square feet of gross floor area. This space will be devoted to University academic uses including the School of Management and executive administration. There will be approximately 270 parking spaces in three levels below grade (see Figure 1-1).

It is imperative to upgrade and update the existing facilities of the School of Management (the School) in order to maintain its excellent standing in the educational community. The School attracts students from all over the world through its undergraduate, graduate and continuing education programs. The academic space in the new School of Management project will serve to consolidate, upgrade, and update the existing facilities by including classrooms, computer rooms, an auditorium, a library, academic offices, and supporting canteen and lounges. The executive administration space will consolidate University administration offices on campus. The site is currently used as a surface parking lot primarily for Boston University employees.

Summary of Benefits

The Project will provide the following benefits to the area and to the University:

- Improve the quality of the School of Management facilities and the quality of education to students.

- Serve to consolidate academic and executive administrative activities on campus.
- Improve the continuity of buildings and activities along Commonwealth Avenue by filling the "gap" created by the current surface parking use.
- Provide pedestrian improvements and new landscaping along the block.
- Contribute to the vitality of the area with complementary activities and provide a transition from commercial to academic uses along Commonwealth Avenue.
- Improve pedestrian and traffic safety along Commonwealth Avenue by constructing pedestrian neck-downs and reducing the number of driveway curb cuts.
- Create new construction jobs in the City of Boston.

Construction of the Project is expected to begin in the spring of 1994 and to be completed in the fall of 1996. The Project concept is illustrated in Figure 1-2.

Building Design

The new School of Management project is to be located at the corner of Commonwealth Avenue and Sherborn Street. The Project proposes sidewalk safety improvements, green space, landscaping, and street furniture along both streets. The building facade is comprised of brick and fabricated limestone-colored pre-cast concrete and large clear glass fenestration in a style which is sympathetic to historic buildings in the area and is consistent with styles of recent buildings developed on campus. The building design includes two entrances, one on Sherborn Street and one on Commonwealth Avenue.

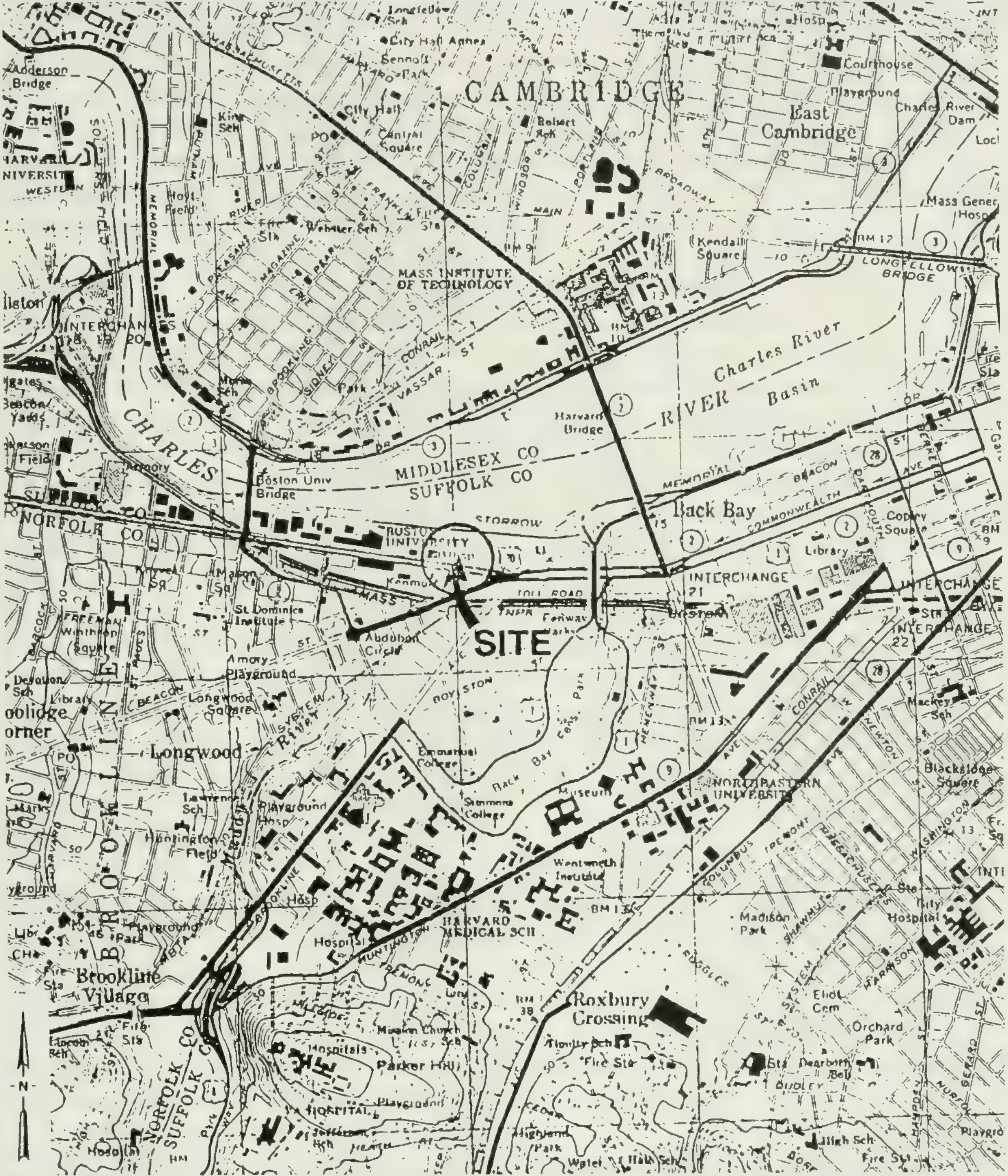
The first six floors of the Project will consolidate the new School of Management under one roof and include a library, lecture hall, case-study rooms, computer rooms, and classrooms. They will also contain offices for School of Management faculty and support administration. The design includes a six floor atrium to encourage informal gatherings and interactions within the school.

The nine story alternative will consolidate some of the University's executive administrative space, currently spread throughout campus on the upper three floors. The Project also will be serviced by three levels of below-grade parking with access from Commonwealth Avenue and egress at Sherborn Street. The Project is more fully described in Chapter 2.0, Project Description.

1.2.1 BACKGROUND

History of Boston University

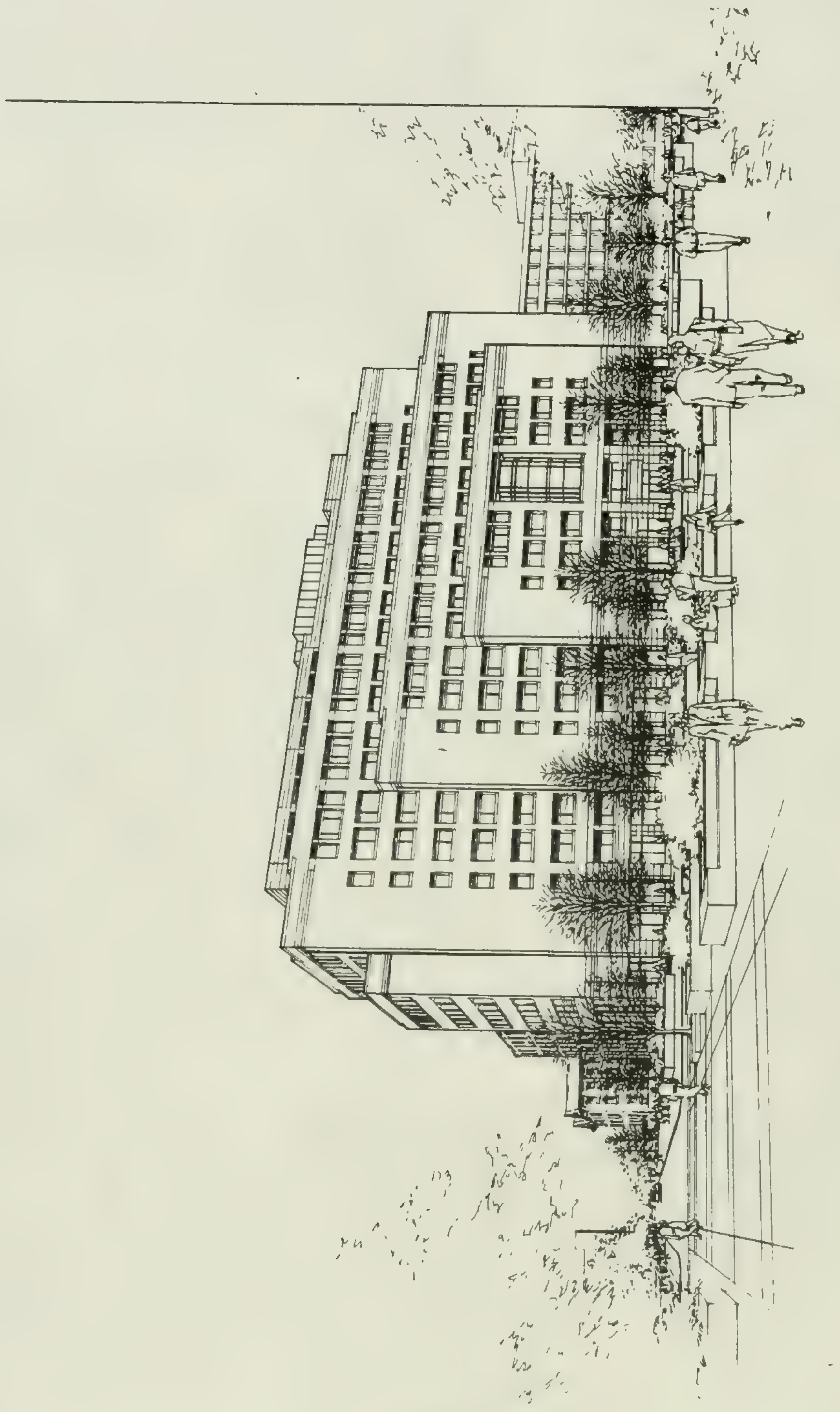
In 1869, Jacob Sleeper, Isaac Rich, and Lee Claflin, businessmen and philanthropists, chartered "Boston University". The College of Liberal Arts initially took residence on Beacon Hill across from the State House. As the University grew, the component colleges were sited in various locations throughout Boston. By the turn of the century, the University Law School, Graduate School of Theology, School of Medicine, and College of Music were spread throughout the City of Boston.



Locus Plan

Prepared By:
Haley & Aldrich, Inc.

Figure 1-1



Building View From Commonwealth Avenue

Building Perspective

Prepared By:
Cannon

Figure 1-2

In 1920, during the term of President Lemuel Herbert Murlin, Boston University bought land on the western end of Bay State Road to consolidate all the colleges into the "Charles River Campus". Bay State Road was lined with town houses, homes, hotels, and small offices largely vacated by residents moving to the suburbs. In the 1940's, the University acquired property on the eastern portion of Bay State Road including the area around the Project site. The University purchased these properties for University offices, residences and dormitories.

In the 1960's, the Charles River Campus was expanded. University facilities--classrooms, art studios, and other academic spaces, were developed in vacant auto showrooms, warehouses, and garages that lined Commonwealth Avenue from Kenmore Square to Brighton Avenue. In addition to the re-use of existing buildings, the University undertook considerable new construction to meet the demands of a growing enrollment throughout the Sixties and Seventies. During this time, the Law School and Law Library, Student Union, and Mugar Library were constructed. Over 3,500 dormitory beds were created in Warren Towers, Sleeper, Claflin and Rich Halls, and the Boston University dormitory. The University also sought to beautify its surroundings by creating the George Hart Way and Warren Alpert Mall along Bay State Road in the 1970s.

During the 1980s, the Metcalf Center for Science and Engineering (Metcalf Center) was built to enhance academic excellence and 635 Commonwealth Avenue, across the street from the Project site, was renovated for the Sargent College of Allied Health Professions. Today, the University offers a wide variety of programs and degrees to over 27,000 full- and part-time students. The University currently has over 17,000 employees.

History of the School of Management

In 1913, the College of Business Administration was established as an evening school. Fifty-one students were in the first graduating class in 1917. The college was located at 525 Boylston Street until it outgrew that location. In 1939, the Charles Hayden Memorial building was built at 685 Commonwealth Avenue to house the Boston University College of Business Administration. This was the first building developed by the University on the Charles River Campus. By this time, the school had grown to 1,300 students and fifty full-time faculty members. The building provided ample space for classrooms, faculty offices and administration.

In the following decades, enrollment increased, curriculum expanded, and faculty also grew. In 1974, the College of Business changed its name to the Boston University School of Management to reflect the comprehensive, broad-based education and innovative, upper level business programs. Current graduate programs include a Doctorate of Business Administration and Masters of Business Administration in Public Management, Accounting, and Health Care. Reflecting a commitment to national and international business, the School has established research centers in human resources policy, Asian management, entrepreneurial management, public affairs, manufacturing, information systems, accounting, and direct marketing.

The University now offers joint degree programs with the College of Engineering, College of Liberal Arts/Graduate School, School of Law, College of Communication, and School of Medicine. This allows opportunities for degrees in:

- Health Care Management and Law
- Medical Science and Management
- Engineering and Management
- Economics and Management
- Management and Law
- Broadcast Administration and Management

The following special programs are offered by the School of Management in addition to the regular graduate and undergraduate programs:

- The Boston Leadership Academy
- The Legislative Advanced Management Program
- The Human Resources Policy Institute
- Manufacturing Roundtable
- Manufacturing Executive Forum
- The Entrepreneurial Management Institute
- The Boston Executive Education Program
- The Executive M.B.A. Program
- The Sanyo M.B.A Program - Tokyo
- The Executive Development Roundtable

Currently, the School's enrollment is nearly 3,500 graduate and undergraduate students and there are over 112 full-time faculty and 81 part-time faculty, who are spread out in six locations across campus. These facilities are over 60 years old and cannot accommodate high technology equipment nor other state-of-the-art facilities for new programs. The need for new and consolidated space is created by programs which have been developed in recent years and by the changes in teaching techniques and facilities. In addition to the need for better classrooms, there is a demand for case-study rooms (requiring higher ceilings and more space per room than is available in existing University facilities), break-out rooms, computer rooms, a periodicals library, and informal lounge and meeting areas. The School of Management program's needs and objectives are more fully discussed in Chapter 2.0, Project Description.

Project Background

In 1986, the University initiated a comprehensive master planning process for the Charles River Campus which resulted in The Boston University Charles River Campus Master Plan 1986 - 1996 (Master Plan). This process included city officials, numerous community groups, and University officials. Due to the inclusive effort, the Master Plan enjoys endorsement by a broad range of groups and individuals including the University. The Master Plan was submitted to the Boston Redevelopment Authority in 1987 and approved on March 26, 1987. The Master Plan which offers a structural framework for campus development of housing, academic space, recreational facilities, and parking, identifies goals and objectives for the ensuing ten year period. It provides a context, in addition to the zoning and environmental review processes, in which specific activities and development projects can be evaluated.

The Project site, the western portion of Site Q, is identified on the Master Plan as a potential site for development. It is located on the block between Deerfield and Sherborn Streets and on the northern side of Commonwealth Avenue. The Master Plan suggests that this portion of Site Q be developed for the purpose of consolidating academic and commercial uses including the School of Management. The Master Plan also calls for the provision of adequate parking to support uses on site. A detailed discussion of the Master Plan can be found in Chapter 3.0, Urban Design.

1.3. PROJECT TEAM

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1.4 CURRENT OR FORMERLY OWNED DEVELOPMENTS IN BOSTON

The University is comprised of two main campuses in the City of Boston: the Charles River Campus concentrated along Commonwealth Avenue from the Kenmore Square area to the eastern edges of Allston around Nickerson (formerly Braves) Field; and the Medical Campus concentrated in the South End between City Hospital and University Hospital. Master plans for each of the two campuses have been approved by the Boston Redevelopment Authority (BRA). Developments in accordance with the master plans are continually ongoing on both campuses. See the figure on the following page for University ownership within the Charles River Campus.

1.5 LEGAL ACTIONS PENDING

The University is not aware of any legal actions pending or threatened with regard to this Project.

1.6 TAX ARREARS

All taxes due have been paid to date.

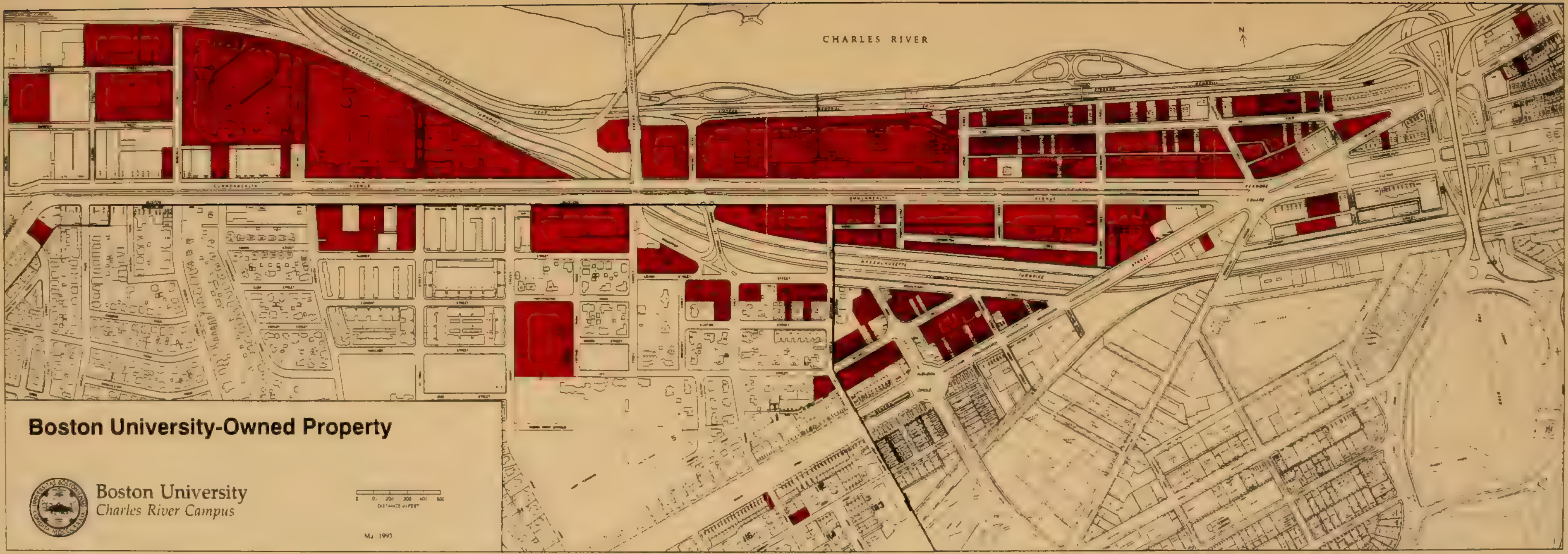
1.7 EVIDENCE OF SITE CONTROL

The Project site was acquired by the University as two separate parcels. The easterly portion of the site was acquired in 1981 from the Lahey Clinic. The westerly portion of the site was formerly a gas station and was acquired from Texaco in 1987. The University holds fee simple title to the entire site.

1.8 AGENCY AND COMMUNITY REVIEW PROCESS

In 1980, Boston University entered into a Cooperation Agreement with the City of Boston for the Charles River Campus which set forth boundaries and general goals and procedures for orderly growth and development of the campus.

In the mid-1980s, a master plan process for the Charles River Campus was established. The Master Plan was prepared over an eighteen month period with considerable involvement by the Boston Redevelopment Authority and residents of the adjacent communities. To enhance the community's participation in the master planning process, the Boston University Task Force was established. This Task Force is comprised of 16 members representing area civic associations, neighborhood associations, business interests, and other groups. A current list of Task Force members include:



Boston University-Owned Property

Boston University
Charles River Campus

May 1993

Allston Board of Trade
Allston Civic Association
Allston-Brighton Area Planning Action Council
Allston-Brighton Community Development Corporation
Audubon Circle Neighborhood Association
Bay State Road Civic Association
Bay State Road Neighborhood Association
Boston University Student Union
Brighton Board of Trade
Brighton Improvement Association
Cottage Farm Neighborhood Association
Fenway Community Development Corporation
Jackson-Mann Community School Council
Kenmore Association
Kenmore Community & Economic Development
Kenmore Residents' Group
North Brookline Neighborhood Association
Society for the Preservation for Audubon Circle

This group met on a regular basis with representatives of the University and the consultant team involved in the master planning process to discuss the plan and to help shape it to respond to their concerns. The published Master Plan bears the endorsement of this group. The Master Plan was completed and approved by the BRA Board in March 1987.

The Master Plan identifies the Project site (the westerly portion of Site Q) for acquisition and development. Through the master plan process, the BRA, Task Force, and University formed a consensus on general uses including support for the Project location on this westerly portion of Site Q as proposed. The property acquisitions for the new School of Management site were completed in 1987. The Task Force subsequently reinforced approval of the Project size, design, use, and location as consistent and appropriate. A more detailed discussion of the Master Plan is found in Chapter 3.0, Urban Design.

University officials have been reviewing the proposed Project with BRA officials since 1991 and Boston University has voluntarily agreed to participate in the Article 31 process for the new School of Management project. Accordingly, a Project Notification Form (PNF) was submitted to the BRA in August, 1992; a Scoping Determination on the PNF was issued October 27, 1992; a Draft Project Impact Report was submitted February 19, 1993; and a Preliminary Adequacy Determination was issued on the Draft Project Impact Report on June 29, 1993 (See Section 1.12).

Presentations were made to the Boston Civic Design Commission (BCDC) and the BRA staff throughout the Project's design evolution. A meeting of the Task Force to review the ten story alternative of the new School of Management project was held November 30, 1992. At this meeting, the Task Force voted ten to four to support the Project.

A presentation was made to members of the Kenmore Association in December 1992 and two meetings with representatives of the Kenmore Tower Association were held early in 1993. In response to discussions and comments through these review processes, the nine story alternative was developed and presented to the Task Force on June 2, 1993.

On June 10, 1993, a public hearing was held by the BRA Board concerning the Development Plan (No. 43) and Development Impact Project (DIP) Plan for the Planned Development Area (PDA) Plan, encompassing the nine story project alternative. Attendance included City Councilors, representatives, and residents from the Project area. Chairperson of the Boston University Task Force, representatives of Kenmore business associations, Bay State Road Neighborhood Association and unions presented letters, petitions and testimony supporting the Project as it improves an existing eyesore, promotes better safety on Commonwealth Avenue, stimulates economic growth, and conforms to the Master Plan. City Councilors O'Neil, Kelly, Hennigan-Casey, Byrne, and Nucci expressed support of the Project particularly in regard to the reduced height and scale, inclusive review process with neighbors, job creation, and economic benefits to the City of Boston through linkage payments and other revenues generated. Concerns were expressed by City Councilor Scondras, three Bay State Road residents and abutters across Commonwealth Avenue regarding building height and protection of groundwater levels during and after construction. In response to these issues, the Project was taken under advisement and the Director of the BRA met with representative residents of the area to discuss their concerns prior to the Board vote.

On June 24, 1993, the BRA Board reconvened and voted unanimously to: approve the Development Plan; authorize the Director to enter into a DIP Agreement and Cooperation Agreement with the University; authorize the Director to petition the Zoning Commission for the PDA designation; authorize the Director to recommend approval of the petition to the Board of Appeal for zoning relief; authorize the Director to issue an Adequacy Determination upon completion of the Article 31 review process; and approve the Schematic Design submission. A copy of the BRA Board vote is included in Appendix F. The Boston Zoning Commission heard and approved the PDA on August 10, 1993.

In addition to the BRA review process, meetings have been held with the Massachusetts Executive Office of Environmental Affairs MEPA Unit, Massachusetts Historical Commission, Massachusetts Bay Transportation Authority and Boston Landmarks Commission. Other local and state permitting agencies have also been contacted on the Project. Boston University officials and design and engineering consultants have been in contact with the Boston Transportation

Department, Boston Department of Public Works, Public Improvement Commission, Boston Water and Sewer Commission, Inspectional Services Department, and Massachusetts Department of Environmental Protection. These discussions will continue as the building design develops.

An Environmental Notification Form (ENF) was filed with the Massachusetts Executive Office of Environmental Affairs MEPA Unit on October 30, 1992. A notice was published in the "Environmental Monitor" on November 9, 1992, and a public consultation session was held November 19, 1992. A Certificate on the ENF was issued on December 9, 1992. A Notice of Project Change (NPC) was filed in accordance with MEPA regulations on January 13, 1993, and published in the "Environmental Monitor" on January 25, 1993. A copy of the NPC was distributed to the ENF distribution list and all parties who submitted written comments on the ENF. Since the NPC was distributed, the new School of Management project has been reduced to nine stories and refined. Presentations of the reduced scale Project have been made to the Massachusetts Historical Commission, MEPA Unit, Massachusetts Department of Environmental Protection, MBTA, Metropolitan District Commission, Executive Office of Economic Affairs, Secretary of State, BU Task Force, and affected neighbors. A Draft Environmental Impact Report is being prepared in accordance with the certificate issued on the NPC.

1.9 COMMUNITY SERVICES AND BENEFITS

For over a century, Boston University has been an integral part of the City of Boston. Committed to an urban campus, it has consistently grown and contributed to the character and identity of the City of Boston and served as a prominent economic stabilizing force. The University's national and international prestige significantly strengthens the City of Boston's national and international reputation. For example, in 1989, both Presidents Bush and Mitterand spoke at Boston University's commencement. In addition to being a significant employer in the City of Boston, the University contributes directly to the economic well-being of the City of Boston and provides direct services to local community residents and businesses.

Economic and Employment Benefits

Benefits from Boston University which contribute to the Boston economy include employment, property taxes, federal grants, and through acquisition of goods and services by the student, faculty and the administrative population. In fiscal year 1992, the University and its affiliates and students expended over $710 million. Of this amount, $558.8 million was spent in direct expenditures within the Commonwealth of Massachusetts. In addition, an estimated $641.2 million in indirect expenditures was generated (based on economic factors from the U.S. Department of Commerce, Bureau of Economic Analysis), resulting in a total impact of $1.2 billion in 1992 alone.

In 1992, Boston University directly employed over 21,500 people and indirectly created approximately 11,500 jobs, providing a total employment impact of close to 33,000 jobs. It was estimated that students alone brought in an additional $129.7 million related to living expenses. The total direct and indirect economic impact from the University in 1992 was estimated to be $396.2 million in the City of Boston.

In the 1992 fiscal year, Boston University employed approximately 2,900 Boston residents who earned more than $58 million in salaries and wages. They used more than 4,500 city vendors of goods and services with direct expenditures of more than $70 million. Student expenditures in the City of Boston totaled over $74 million.

The new School of Management project will create approximately 300 construction jobs. It is estimated that the Project will also contribute over $1.3 million in linkage payments to the City of Boston to be used for job training and affordable housing in accordance with Articles 26A and 26b of the Boston Zoning Code.

Tax Status

Boston University makes direct payments to the City of Boston in the form of taxes, in-lieu-of-tax payments, fees and permits. In fiscal year 1992, the University paid the City of Boston over $2.8 million. This reflects $1.9 million in real estate taxes, $331,000 in-lieu-of-tax payments, and $577,000 in fees and permits.

Under the 1980 Cooperation Agreement with the City of Boston, notwithstanding its tax-exempt status, the University voluntarily pays real estate taxes on any taxable properties acquired after 1980 within the boundaries defined in this document. Since that time, the University has paid a total of $2 million in taxes and in-lieu-of tax payments. Accordingly, the University continues to pay property taxes on the Project site which were estimated to be $23,714.07 in FY 1993.

Municipal Services

As a major urban institution in the City of Boston, Boston University takes the responsibility of providing and augmenting major municipal services in and around its campus. It employs its own police and security forces 365 days a year, 24 hours per day to patrol the campus and surrounding neighborhoods. University police forces are also available for on-call back-up assistance to Boston Police, Brookline Police and State Police as necessary. They also assist the City of Boston in the issuance of parking tickets, which raised approximately $50,000 in 1992.

The Boston University Physical Plant provides a variety of daily maintenance activities around campus. These responsibilities include maintenance of sidewalks, streets, and MBTA tracks serving the campus. They also provide and maintain landscaping and perform rubbish and snow removal services. In 1992, these services were provided at a cost of over $600,000. Rubbish removal services are provided for private rental housing properties in addition to properties owned and occupied by the University.

Scholarship Programs

The University annually provides hundreds of scholarships to residents of the Greater Boston community. The Boston Scholarship Program awards 58 full, four year scholarships to Boston High School graduates every year. This program, which is 20 years old, is the largest program of its kind in the United States. In 1992, over 350 scholarships worth close to $5 million were awarded to Boston public high school graduates, Boston city employees, Boston public school teachers, Boston parochial school graduates, graduates of Bunker Hill and Roxbury Community Colleges, and families of fire fighters killed in the line of duty. Over the past ten years, almost $1 million in aid has been designated for City of Boston employees of which 63% has been directed to City of Boston employees attending the School of Management. The cumulative value of such scholarships since 1981 is over $33 million. In addition, the University provides scholarships to residents of Chelsea and Brookline.

Boston University cultivates a significant amount of federal research dollars, student loans, and donations from outside the state. In the 1991-1992 academic year, the University brought approximately $220 million to Boston in tuition and fees from outside the state. It also won $60 million in federal research funding and brought in $37.2 million in donations, $31.5 million of which were from outside the state. Student loan activity associated with Boston University totaled almost $35 million in the 1991-1992 academic year.

School of Management Community Programs

Boston University is committed to supporting the City of Boston with targeted educational programs. In 1987, the Boston Leadership Academy was founded as a jointly sponsored institute of the Boston University Schools of Management and Education. The Academy has trained over 150 teachers, administrators, and principals to assume leadership positions in the Boston Public School system. Over the last two years, the Academy has been actively involved in a "grass roots" organizing effort to involve all members of the Boston community in the transformation of the public school system. Through this focus, over 300 parents, teachers, and administrators have been trained to assume roles of leadership in their local schools. The Academy is also actively involved in recruiting, training, and supporting school-based facilitators to help local schools integrate parents into the decision-making process. Notable alumni of the Boston University School of Management include Samuel Gerson, Chairman and CEO of Filene's Basement Inc.; Michael Grossman, Chairman Emeritus of Grossman's Lumber Co.; and Ed Boudreau, Jr., Chairman and CEO of John Hancock.

Other Community Services

Boston University provides numerous educational, training, health, legal and cultural programs which are directly and indirectly funded by the University. Boston University also allows tuition reduction for City of Boston employees. The following is a list of program categories. A summary description of each program may be found in Appendix A, Boston University Community Programs.

Services to Educational Institutions

Centers, Institutes, and Partnerships
Student Teacher Field Placements
Early Childhood and Middle School Programs
Secondary School Programs
Programs for Teachers and Administrators

Services to Other Non-Profit Institutions

Staff Training
Professional/Technical Assistance
Volunteer Staffing
Funding and In-Kind Donations

Services to Individuals and the Community at Large

Scholarship Assistance
Government and Community Affairs
Health Care Services
Dental Care Services
Athletics/Fitness
Adult Education Programs
Programs for Professionals
Programs for the Elderly
Programs for People with Disabilities
Mentoring and Counseling
Religious Education and Ministry
Legal Assistance
Charities/Community Action
Cultural and Intellectual Programs

Project Benefits

The new School of Management project is subject to Article 26A and 26B of the Boston Zoning Code which established linkage obligations for developers to off-set impacts of large scale development. Article 26A requires a payment toward low and moderate housing through the direct creation of housing or contribution to the Neighborhood Housing Trust. Similarly, Article 26B requires a contribution to the Neighborhood Housing Trust for training of low and moderate income people, or creation of such jobs directly by the development. For the Project, the nine story alternative will generate approximately $1,108,500 in housing linkage funds and approximately $221,700 in job linkage funds to the City of Boston. Furthermore, the Project will create approximately 300 construction jobs over a two and one-half year period.

In addition to the direct economic benefits, the new School of Management project will create other positive benefits to the neighborhood area. The Project will result in the revitalization of an unsightly block adding to the vitality and safety along that block of Commonwealth Avenue and Sherborn Street bordering the site. The Project design includes landscaped areas and street furnishings along with curb-cut reductions which provide important pedestrian and traffic safety improvements along the block as well as pleasing relief from hard urban elements. The new School of Management also expands and strengthens the market for Kenmore Square area businesses with the influx of students and employees close to the Square.

1.10 SUMMARY OF ENVIRONMENTAL ISSUES AND MITIGATING MEASURES

A Draft Project Impact Report (DPIR) was submitted on February 19, 1993, in accordance with the October 27, 1992, Scoping Determination issued by the BRA pursuant to the Project Notification Form on the Boston University new School of Management project. A Preliminary Adequacy Determination on the DPIR was issued June 29, 1993. Since the submission of the DPIR, a reduced scale alternative has been developed to mitigate concerns expressed about impacts from the original ten story concept. This nine story alternative reflects elimination of one floor, reduction in floor to ceiling heights, and a reduction in the height of the mechanical penthouse. This alternative offers a height reduction of over 18 feet, elimination of approximately 11% of gross square footage, and reduction to a FAR of 6.5. This Final Project Impact Report has been prepared in accordance with the Adequacy Determination.

The following is a summary of environmental topics and mitigation measures addressed in this report. Analyses of both nine story and ten story project alternatives are discussed.

WIND - Chapter 4.0

Impact

A qualitative assessment of the pedestrian level wind environment for the No-Build and Build condition was conducted for the ten story project alternative. The qualitative findings reveal that the ten story Build alternative wind conditions will generally increase along the Project site boundaries along Commonwealth Avenue and Sherborn Street, particularly in the winter. There may also be increased wind conditions along the MBTA stop in the middle of Commonwealth Avenue across from the site. The qualitative findings indicated that a quantitative analysis was warranted to better assess a few localized areas of accelerated wind speeds.

A quantitative analysis was subsequently conducted in accordance with BRA guidelines for the nine story project alternative which included a specialized landscaping plan. The quantitative analysis of the nine story alternative revealed that, overall, the Build condition creates moderately better wind conditions than under the No-Build scenario. Most locations will be well-suited for pedestrian use throughout the year including the main entrances to the Project, near the Boston University dormitory, and open spaces along Commonwealth Avenue. The residential area along Bay State Road and Sherborn Street will experience unchanged or slightly improved wind conditions. Wind conditions along Commonwealth Avenue will be within acceptable levels, with the exception of the MBTA waiting area located on the median of Commonwealth Avenue, where Build conditions will just exceed the BRA - acceptable levels for walking, primarily in the winter time. The No-Build condition for the Commonwealth Avenue median also exceeds BRA levels acceptable for walking. Other locations reviewed in the Project area will experience conditions similar to existing conditions.

Mitigation

The reduced height and massing of the nine story alternative provide relief to areas with potentially unacceptable wind conditions. Further mitigation is provided by the development of a specialized landscaping design which considered selection and location of appropriate landscape materials to provide relief to problem locations. The landscaping design was included in the quantitative analysis as part of the nine story project alternative. The University is currently working closely with the MBTA on shelter designs for the trolley stop and has committed to contribute toward implementing these improvements.

SHADOW - Chapter 5.0

Impact

A shadow study was conducted for both the nine and ten story alternatives to identify net new shadows cast by the Project on public streets, walkways, open space and the adjacent historic neighborhood. The analysis examined conditions during the vernal equinox, summer solstice, autumnal equinox, and the winter solstice at 9:00 AM, noon, and 3:00 PM. No new shadows are cast upon Bay Sate Road front facades during the spring, summer, and fall season study scenarios. Some new shadows are created by the Project, but these are limited to mid-winter and generally do not linger throughout the day. The vast majority of the buildings impacted during the winter months are owned and occupied by the University.

The new shadows which are created will be most evident during the winter, when the sun is at its lowest, along certain portions of Bay State Road and a small section of the southern bank of the Charles River. Public areas and buildings on Bay State Road will not experience a significant change from the existing shadow pattern during winter months. During the remaining nine months of the year, when outdoor activities are most frequent, there will be little or no change in shadow impacts to public areas.

Mitigation

The nine story project alternative was developed to minimize potential visual impacts from the Project. The reduced height and bulk of the nine story alternative mitigates impacts from the original ten story project alternative by reducing the extent of shadows cast along the southern bank of the Charles River, pedestrian areas, and on the historic buildings on Bay State Road.

DAYLIGHT - Chapter 6.0

Impact

A daylight analysis of the Project was conducted for both the nine and ten story project alternatives using the Boston Redevelopment Authority Daylight Analysis (BRADA) model. The analysis evaluated the daylight values of the Project from two pedestrian level view points, one on Sherborn Street and one on Commonwealth Avenue. An additional analysis was conducted for comparison purposes on a similar building close to the Project site, 566 Commonwealth Avenue (Kenmore Tower Apartments). The analysis revealed that daylight values for the Project are similar to the daylight values of Kenmore Tower. The daylight values for the ten story project alternative are approximately 57% on Commonwealth Avenue and approximately 51% on Sherborn Street. This compares to approximately 52% for Kenmore Tower.

Mitigation

The nine story project alternative was developed to mitigate potential visual impacts from the Project. The daylight analysis for the nine story alternative shows a reduced daylight obstruction value along Commonwealth Avenue to approximately 54%. The daylight value along Sherborn Street remains the same at approximately 51%. The daylight values associated with the Project are appropriate for the character of the Project site and its location on Commonwealth Avenue near Kenmore Square, and are in keeping with other buildings in the area such as Kenmore Tower.

NOISE - Chapter 7.0

Impact

The difference in noise impacts between the nine and ten story project alternatives is minimal. The primary potential sources of noise associated with the Project will be from the building mechanical systems, garage exhaust system, and construction activities. Potential impacts on nearby sensitive receptors are of particular concern. Noise levels for construction and operations will comply with the Regulations for the Control of Noise in the City of Boston.

Mitigation

The majority of the building's mechanical systems are located in an enclosed mechanical penthouse, approximately 150 feet from the ground and set back from the building's edge. The emergency generator located in the penthouse will only operate during emergencies and during tests which will only be conducted at times of least impact. The noise produced by these systems will meet, or be lower than, noise levels allowed by the City of Boston. The subsurface parking garage exhaust fans, which emit air and noise through louvers, are located in the back alley. They will be outfitted with duct silencers to reduce noise to acceptable levels in accordance with City of Boston noise regulations.

A Construction Management Plan will be submitted to the City of Boston and implemented. This plan will address noise issues associated with construction work hours, maintenance of engine mufflers and other relevant equipment, truck routes, and staging and handling of excavated materials. No impact pile driving is anticipated during construction. Construction impacts and mitigation are discussed separately in this section and fully in Chapter 11.0, Construction.

AIR QUALITY- Chapter 8.0

Impact

The difference in air quality impacts between the nine and ten story project alternatives are negligible. Potential sources of air pollution associated with the Project involve vehicular traffic, mechanical systems, and construction activities. Net new vehicle trips associated with the Project will be negligible, as the Project primarily relocates existing University uses in the vicinity and there is excellent access to public transportation and a Boston University campus shuttle bus. A full discussion of transportation issues is found in Chapter 14.0, Transportation. The parking garage is subsurface and requires exhaust systems which are vented above ground. Other mechanical systems are vented above the mechanical penthouse, 150 feet above the ground.

Construction activities are not anticipated to generate significant air emissions. Emissions will be comprised principally of fugitive dust and exhaust from construction equipment.

Mitigation

All building mechanical systems meet applicable state and City of Boston air quality standards. The garage exhaust system will have carbon monoxide sensing devices with automatic on/off switches to maintain healthy air quality levels within the garage. Garage exhaust louvers are located in the alley, away from pedestrian activity. Dust associated with construction will be controlled with regular application of wetting agents. Trucks carrying debris will be covered.

Construction equipment will be maintained in good working order to reduce equipment emissions. All exposed areas will be temporarily stabilized to the extent practicable and environmentally benign wetting agents applied to control fugitive dust. Only licensed haulers using covered trucks will be used. Sweeper trucks will clean Commonwealth Avenue and Sherborn Street on a daily basis. Construction impacts and mitigation are discussed separately in this section and fully in Chapter 11.0, Construction.

SOLID AND HAZARDOUS MATERIALS - Chapter 9.0

Construction

Impact

Construction techniques and the handling and disposal of materials do not significantly differ between the nine and ten story alternatives. Investigations of the Project site indicate the presence of some soil and groundwater contamination largely from petroleum products formerly stored on portions of the site. The site investigation included seven test borings and seventeen test pits.

The types and concentrations of compounds detected are consistent with previous site usage and do not constitute an imminent hazard to human health, safety, or to the environment.

Mitigation

Special measures for the proper disposal of contaminated soil and groundwater will be implemented when such contaminants are encountered within the limits of excavation during construction. A draft Disposal Management Plan (DMP) has been prepared. The DMP outlines procedures for on-site classification, handling, testing, and disposal of contaminated soils. A final DMP will be part of the construction documents and will be binding on construction contractors. The draft DMP is found in Appendix B.

Temporary dewatering will be conducted inside the excavation support system to enable foundation construction. The necessary permits for groundwater discharge will be obtained from Boston Water and Sewer Commission. Groundwater quality and discharge will be monitored and, if necessary, treated in accordance with such permits.

Operations

Impact

The building will generate solid wastes typically associated with office and classroom uses. The wastes will be handled by a licensed hauler as part of the existing University solid waste management system. There may be slightly less solid waste generated from the nine story alternative than from the ten story alternative.

Mitigation

The Project building is designed to include dedicated recycling areas on each floor. Each of these areas will accommodate six recycling bins for newspaper, office paper, aluminum, plastic, glass, and miscellaneous items such as styrofoam cups. These recycling bins will be emptied regularly as part of the University's recycling program.

GEOTECHNICAL - Chapter 10.0

Impact

The difference in geotechnical impacts between the nine and ten story project alternatives is negligible because subsurface building design remains essentially the same. Three levels of below-grade parking are included in both the nine and ten story project alternatives. The building will be supported by a reinforced concrete mat foundation bearing in the marine sand and/or clay soils.

The excavation for building construction will require a temporary support system and temporary dewatering within the limits of the site.

Mitigation

The University owns all abutting properties and the majority of the buildings in the vicinity of the Project site. The University maintains a policy that its structures be built and maintained to achieve a 75 to 100 year life span. To protect its property and achieve longevity goals, it is imperative that no settlement or soil movement occurs during or after construction of the Project. This is the primary factor in the foundation design and construction techniques being considered. The mat foundation will be designed as a compensating foundation, and long-term, post-construction settlements will be negligible. The below-grade walls and mat of the structure will be waterproofed, and there will not be a permanent foundation underdrain. Therefore, long-term groundwater levels will remain unchanged after building construction.

Temporary dewatering during construction will be conducted inside the excavation support system. The temporary excavation support system will consist of continuous interlocking steel sheetpiles that will be installed along the perimeter of the excavation. The steel sheeting is a relatively impermeable temporary support wall selected, in part, to maintain existing water levels outside the site limits. An alternative excavation support system is currently being considered. This system would consist of a soil mix wall similar to those being used in the Central Artery/Tunnel Project in East Boston. A geotechnical instrumentation program will be conducted during construction to monitor construction activities and buildings adjacent to the site. Although significant changes to the water table are not anticipated, a Groundwater Protection Plan to address any changes in the water table which might occur during construction will be prepared for review by the BRA. A draft plan is included in Appendix B.

CONSTRUCTION - Chapter 11.0

Impact

Construction activities associated with the nine story alternative are not significantly different from the ten story alternative. The Project will be constructed over a 28 month period from the spring of 1994 through the fall of 1996. The Project is estimated to have an average daily work force of 100 to 120 people including construction workers, and University, architectural, and engineering staff. It is anticipated that construction hours will be from 7:00 AM to 3:30 PM.

Mitigation

Construction staging for the Project will be located on-site and at 620 Commonwealth Avenue, a previous construction staging area. Displaced parking will be located on campus at other

University controlled lots. There is ample public parking in the area for construction workers and excellent public transportation to the Project site. The University will subsidize construction worker MBTA passes to further mitigate potential traffic and parking impacts during construction. This is discussed further in Chapter 14.0, Transportation. Designated truck traffic routes which avoid residential streets will be utilized.

Air quality impacts will be minimized through dust control by wetting agents and inspections of vehicles on-site. Noise impacts off-site are not expected to be significant as there will be no blasting or impact pile driving during construction. When dewatering is necessary, water will be monitored for its quality, treated prior to discharge when warranted, and discharged into the storm drain in Commonwealth Avenue. Construction techniques will be employed to protect utilities from unnecessary disruption. Groundwater levels will be maintained during and after construction so as to protect the foundations of adjacent buildings from any adverse impacts. A plan addressing any changes to the water table during and after construction will be prepared and submitted to the BRA.

Precautions will be taken to protect public safety through covered walkways, fencing, University security patrols, and police details as necessary. There will be coordination with other construction activities in the area. A Construction Management Plan will be prepared and implemented before construction. This Construction Management Plan will address:

- Staging for materials and machinery
- Traffic management plan and police coverage
- Designated truck routes and waiting areas
- Pedestrian safety and security
- Dust and air quality controls
- Dewatering monitoring and treatment procedures
- Foundation protection techniques
- Noise and vibration controls
- Handling of excavated materials
- Rodent control measures

HISTORIC/ARCHAEOLOGICAL - Chapter 12.0

Impact

The new School of Management project is not located in an historic district and there are no recorded archaeological resources on-site . However, the Project site is located adjacent to the Bay State Road/Back Bay West Architectural Conservation District, with the majority of buildings on Bay State Road are owned and occupied by Boston University. The Project site is also near the Charles River Basin District and the potential exists for undocumented archaeological resources.

An archaeological reconnaissance survey of the site was conducted to determine the potential for the remains of a prehistoric fishweir. The reconnaissance revealed that, due to the land and topographic characteristics of the site, the site has potential for undocumented prehistoric remains in undisturbed marine deposits below the level of historic fill. As the building construction will include excavation for a parking garage, the potential exists for encountering archaeological resources in previously undisturbed marine deposits.

An Archaeological Monitoring Program will be implemented during construction to detect the presence of potential archaeological resources. The monitoring program will be conducted in conjunction with the installation of the perimeter wall and with each level of excavated material. In the event artifacts are discovered, a handling plan will be developed in conjunction with the Massachusetts Historical Commission. The specifications of a final monitoring program will be developed with the Boston Landmarks Commission and the Massachusetts Historical Commission prior to commencement of construction.

Additional assessments of potential shadow, wind, and view impacts on the historic district were conducted for both the nine and ten story project alternatives. Some new shadow is created along the Charles River and portions of Bay State Road during the winter months but no new shadows are evident during the study scenarios for the other seasons (see Chapter 5.0, Shadow). Visual analyses of the proposed building from within the historic district show that the Project can be seen from the District, but does not dominate its character. Wind conditions within the historic district along Sherborn Street and Bay State Road will remain unchanged or will be slightly improved as a result of the Project (see Chapter 4.0, Wind).

Mitigation

The nine story project alternative was developed largely to mitigate potential visual impacts from the Project on the adjacent historic district and Charles River. As a result, the wind, shadow and visual impacts resulting from the Project have been reduced. Design materials and treatment of the building highlight the use of brick, stone, and limestone colored pre-cast concrete in a manner compatible with nearby historic buildings, such as the Myles Standish Hotel and other historic buildings on Bay State Road.

INFRASTRUCTURE - Chapter 13.0

Impact

The Project site is currently served by water, storm drainage and sanitary sewerage systems under the ownership and/or control of the Boston Water and Sewer Commission (BWSC). Water supply and sewage treatment services are provided to BWSC by the Massachusetts Water Resources Authority (MWRA). Stormwater runoff is diverted primarily into the BWSC Muddy River conduit. The nine story alternative will generate a slightly reduced utility demand compared to the ten story alternative, but this reduction is not enough to justify downsizing service connections to the building.

Water
The peak domestic water demand created by the Project has been estimated to be 237 gallons per minute (GPM) for the nine story alternative, reduced from 258 GPM for the ten story alternative. Domestic water service will be supplied by the existing 16-inch low service water main located in Commonwealth Avenue.

Fire Protection
Estimated fire protection water demand for both the nine and ten story project alternatives is 1,250 GPM. Fire protection service will be supplied by the existing 16-inch low service water main located in Commonwealth Avenue.

Sanitary Sewage
Sanitary sewage generated by the ten story alternative was estimated to be approximately 49,575 gallons per day (GPD), which is reduced to 46,870 GPD with the nine story alternative. The sewage will be conveyed from the site via a 12-inch sanitary sewer connection to an existing 18-inch sewer line located in Commonwealth Avenue. This existing 18-inch line contributes to a sewer network which discharges into the Charles River Valley Sewer.

Stormwater
Stormwater runoff from the site will not increase over current levels. The existing site functions as a parking lot with an impervious bituminous concrete surface. The Project will serve to slightly reduce the amount of runoff by the addition of landscaped areas on the site. Stormwater will be routed from the site into an existing 18-inch storm drain located in Commonwealth Avenue. This pipe increases first to 21 inches, then to 24 inches before it discharges into the Muddy River conduit.

As the Project eliminates surface parking, it will improve the quality of stormwater runoff and reduce the potential for discharge of oil and other vehicular related contaminates into the storm water system. The nine and ten story alternatives will produce the same results.

Other Utilities

Other utility services such as electrical, telephone/telecommunications and natural gas will be provided by private utility companies.

Mitigation

Through ongoing discussions and meetings with BWSC, and other utility companies, it has been determined that there is sufficient capacity to support all utilities needed to service the Project. It is anticipated that BWSC will be able to meet the water and sewer demands of both the nine and ten story project alternatives with the existing systems. The building design incorporates water conservation techniques which minimize the water use through employment of water saving plumbing fixtures, efficient air conditioning systems, and an irrigation system which minimizes demands on utility systems. Energy saving devices are also included in the mechanical systems of the Project. Oil/water separators will be employed in the drains from the parking garage to protect water quality.

TRANSPORTATION - Chapter 14.0

Impact

As the new School of Management project will replace existing academic facilities on the campus, it will not result in a significant addition of students, faculty, or staff to the campus transportation system. The difference between the nine and ten story alternatives on transportation impacts is so small, that to be conservative, the ten story numbers are used throughout the analyses. On a daily basis, the Project is expected to generate a total of approximately 228 new vehicle trips. Approximately 57 of these trips are expected to occur in each of the morning and evening peak hours. Two signalized intersections in the vicinity of the Project site were analyzed for traffic impacts. The analysis showed that both intersections operate at Level-of-Service (LOS) D or better under existing conditions. In the future, under No-Build conditions, the Kenmore Square intersection is forecast to decline to LOS E from LOS D during the morning peak hour. No decline in LOS or degradation of intersection operations is anticipated as a result of the proposed development.

The parking element of the Project balances the need to protect the adjacent neighborhoods from unwelcome parking burden from the Project and also encourage the use of alternative modes of travel such as public transportation, walking, and bicycling. The additional 89 parking spaces constructed with this Project will accommodate the uses on site, including most of the demand from the Executive Education Center. The Project is not anticipated create any significant increases in parking demand except associated with the Executive Education Center activities. On days when average-attendance training seminars are occurring (about 80 participants), it is estimated that up to 40 additional parking spaces would be needed. This additional demand can be accommodated on the site. A few times per year, the Executive Education Center will be used to its full-capacity (240 participants) requiring an estimated 120 parking spaces. On these occasional days, the University will park attendees at the site and at other nearby locations such as the Bay State Road lot, the 700 Commonwealth Avenue garage, and elsewhere to discourage parking in nearby neighborhoods.

The new School of Management project is forecast to generate a total of 750 transit trips per day. Fewer than 100 of these trips will be new to the Charles River campus and, therefore, the impacts on overall transit operations will be negligible.

Mitigation

The mitigation plan developed for the Project identifies a variety of measures/actions and efforts aimed at proper management of transportation in the area. A Transportation Access Plan Agreement which will detail mitigation measures in the following categories will be prepared and implemented:

- *Travel Demand Management*
  This will include initiatives in ridesharing, public transportation promotion, a Transportation Awareness Day, bicycle transportation, variable work hours, a preferential parking program, and transit pass sales.

- *Vehicle Access and Circulation*
  This will include improved signal operations, consolidation of curbcuts to the site, and continued enforcement of traffic and parking regulations.

- *Public Transportation*
  The University will continue its maintenance program for the MBTA's Green Line median strip adjacent to the school, and will continue its support for the circumferential transit line planning.

- *Pedestrian Access and Circulation*
  Strategies in this category include handicapped access, landscape improvements, and pedestrian safety measures.

- *Transportation Coordination*
  The University anticipates continued close cooperation with the City of Boston in promoting traffic and pedestrian safety and efficiency. The University anticipates updating its campus-wide parking master plan in conjunction with the 1996 Campus Master Plan renewal.

- *Construction Traffic Management*
  This element involves preparation of a construction traffic management plan, designated truck routes, covered pedestrian walkways, on-site storage areas for construction materials, truck waiting areas, and police officer traffic management. The University will subsidize construction worker MBTA passes to contribute to traffic and parking mitigation.

- *Monitoring Program*
  The University is committed to arriving at a reasonable set of travel demand reduction goals and will monitor development-generated transportation and parking characteristics.

1.11 REGULATORY CONTROLS AND PERMITS

State Approvals

Private projects requiring state permits may be subject to state environmental review under the Massachusetts Environmental Policy Act (MEPA). Projects which exceed stipulated size or impact thresholds are required to file an ENF and, in some cases, an Environmental Impact Report (EIR). An ENF was filed on the new School of Management project on October 30, 1992, based on the potential for the use of Health and Educational Facilities Authority (HEFA) financing for the Project. A Certificate on the ENF was issued on December 9, 1992, requiring the preparation of an Environmental Impact Report. However, as the University subsequently decided it did not intend to pursue HEFA financing in connection with the Project. A NPC was subsequently filed with the MEPA Unit on January 13, 1993, documenting this change. A Certificate on the NPC was issued on March 19, 1993, and it was determined that an EIR is required. An EIR is being prepared in accordance with the Certificate.

Other state approvals are limited to a sewer connection permit issued by the Massachusetts Department of Environmental Protection and review by the Massachusetts Historical Commission (MHC). MHC has been presented with the reduced scale alternative for the Project. It is anticipated that MHC's review will be concurrent with the MEPA review. The Massachusetts Department of Environmental Protection is familiar with the Project through the MEPA process. A sewer extension and/or connection permit application will be filed with DEP toward the end of the MEPA process. If necessary, a filing under Chapter 21E of the Massachusetts Contingency Plan will be submitted for the Project site.

Boston Redevelopment Authority

While the Boston Zoning Code does not require the preparation of a Project Notification Form (PNF) or a Project Impact Report (PIR) for the new School of Management because the Project site is not within the boundaries of the Article 31 review area, the proponent recognizes the importance of the City of Boston goals and interests embodied in Article 31 and the important urban location of the Project. Furthermore, the BRA has already approved a Master Plan for the Boston University Charles River Campus provided by the proponent. Therefore, the University is voluntarily submitting a Project Impact Report in connection with the Project. A Draft PIR was filed February 19, 1993, and a Preliminary Adequacy Determination issued June 29, 1993. On June 24, 1993, the BRA Board voted to recommend approval of the PDA designation for the site to the Boston Zoning Commission (see "City of Boston Approvals" following) and to recommend approval of zoning relief to the Boston Board of Appeal. The Schematic Design of the Project was approved concurrently with the June 24, 1993, BRA Board vote. Further design review is in progress.

City of Boston Approvals

The BRA has petitioned to have the Boston Zoning Commission designate the site as a Planned Development Area (PDA) pursuant to Section 3-1A(a) of the City of Boston Zoning Code. The Commission heard and approved the PDA on August 18, 1993. This designation permits the development of the site in accordance with the Development Plan approved by the BRA. This procedure was also identified for this site in the approved "Charles River Campus Master Plan."

According to the maps accompanying the Boston Zoning Code, the Project site is located in a B-4, or General Business zoning district. Colleges and universities granting degrees by authority of the Commonwealth of Massachusetts are conditional uses in B-4 zoning districts. The proponent is now preparing to apply to the Boston Board of Appeal for exceptions to certain provisions of the Boston Zoning Code, including provisions regarding uses allowing colleges and Universities granting degrees, library uses, limited food sales, floor area ratio, parking garages, off-street loading, signage, side and rear yard, and parapet setback requirements.

Meetings with the Boston Department of Public Works, Boston Transportation Department (BTD) and Public Improvement Commission (PIC) have been held to discuss changes to the street and curb. A PIC hearing is anticipated for final approval. There will be further meetings with BTD to finalize a Transportation Access Plan Agreement and Construction Management Plan. Contact with all necessary reviewing and permitting agencies are ongoing. Meetings and discussions with the BWSC are ongoing. Water and sewer connection approvals and a construction dewatering permit will be needed. Connection permit applications will be submitted to MWRA simultaneously with BWSC applications.

Anticipated approvals are summarized on the following table.

STATE AGENCY	*APPROVAL*
Executive Office of Environmental Affairs	MEPA Certificate of Compliance
Department of Environmental Protection	Compliance with Massachusetts Contingency Plan Sewer Extension and/or Connection Permit
Massachusetts Water Resources Authority	Sewer Use Discharge Permit
Massachusetts Historical Commission	Finding of No Adverse Effect

MUNICIPAL AGENCY	*APPROVAL*
Boston Redevelopment Authority	Approval of PDA/DIP Design Review Approval Zoning Recommendations
Boston Employment Commission	Construction Employment Plan
Boston Zoning Commission	Planned Development Area Designation
Boston Board of Appeal	Zoning Exceptions
Boston Committee on Licenses	Inflammable Materials Storage Lic. Garage Permit
Boston Fire Department	Fire Apparatus Access Approval Permit for Maintenance of Fire Protection Equipment
Boston Inspectional Services Department	Demolition Permit Building Permit Certificate of Occupancy
Boston Water and Sewer Commission	Sewer Connection Approval Water Connection Approval Construction Dewatering Discharge Permit
Boston Department of Public Works	Curb Cut Permit Street Opening Permit Street Occupancy Permit Approval for sign, awning, hood, canopy or marquee
Boston Public Improvement Commission	Approval of Modifications to Curb
Boston Civic Design Commission	Design Review
Boston Transportation Dept.	Transportation Access Plan Agreement Construction Management Plan

1.12 BRA PRELIMINARY ADEQUACY DETERMINATION ON THE DRAFT PROJECT IMPACT REPORT

Boston
Redevelopment
Authority

Raymond L. Flynn, *Mayor*
Clarence J. Jones, *Chairman*
Paul L. Barrett, *Director*

June 29, 1993

Mr. Paul Rinaldi, Director
Office of Space Management
Boston University
25 Buick Street
Boston, MA 02215

Dear Mr. Rinaldi:

Re: School of Management Project: Preliminary Adequacy Determination

This letter is the Preliminary Adequacy Determination (the Determination) of the Boston Redevelopment Authority (BRA) with respect to the Draft Project Impact Report (DPIR) submitted by Boston University regarding the Proposed Project.

The Proposed Project is being reviewed pursuant to multiple sections of the Code. The BRA is issuing the Determination pursuant to Section 31-5 of the Boston Zoning Code (Code). The Determination requests additional information required by the BRA in order to proceed with its project review pursuant to Article 31 of the Code which Boston University voluntarily agreed to undergo.

The BRA has made a preliminary finding based on the level of information in the DPIR that the Proposed Project, without proper mitigation measures, may cause some adverse impacts. The Technical Appendix attached to this letter identifies specific areas of concern and requests preparation of additional information and investigation of additional mitigation measures. Apart from these issues, the balance of the DPIR submitted is sufficient to satisfy the scoping requirements.

Article 31 of the Code sets out a comprehensive procedure for project review and requires the promulgation of a Final Adequacy Determination (FAD) prior to the issuance of a building permit. The FAD is issued upon determination by the BRA that the Final Project Impact Report provides satisfactory evidence that adequate mitigation strategies have been generated for all potential adverse impacts for the proposed project. We look forward to reviewing the Final Project Impact Report.

Sincerely,

Beverley E. Johnson

Beverley E. Johnson
Assistant Director for Institutional
Planning and Development

One City Hall Square
Boston, MA 02201-1007
Telephone (617) 722-4300
Fax (617) 367-5916

TECHNICAL APPENDIX

TO THE

PRELIMINARY ADEQUACY DETERMINATION

FOR

THE BOSTON UNIVERSITY

SCHOOL OF MANAGEMENT PROJECT

I. DEVELOPMENT REVIEW REQUIREMENTS - ARTICLE 31

Article 31 of the Boston Zoning Code promulgates a process by which large-scale development projects are reviewed by the Boston Redevelopment Authority (BRA) and the public to ensure that they enhance the public welfare. In its review of the Draft Project Impact Report (DPIR) of the School of Management Project and the public comments which were received, the BRA has identified a number of project issues. Some will require additional analysis and clarification and others, where the current level of analysis indicates the potential for adverse project impacts, will require either additional mitigation measures or modification of the project or both. The proponent must adequately respond to the issues that are raised herein in its submission of the Final Project Impact Report (FPIR) in order for the BRA to find the project mitigation measures satisfactory and issue a Final Adequacy Determination (FAD). The following is a description of the BRA's review of the DPIR and the additional information which must be included in the FPIR.

A. General Information

The general information provided is sufficient except with regard to the following.

The discussion of municipal tax revenues on pages 1-16 and 2-19 needs to more clearly define the current payment-in-lieu of taxes paid on the site and estimate the future annual payment-in-lieu-of taxes to be paid by the proponent.

The discussion of the zoning relief needed for the project on pages 1-27 through 1-29 is inadequate. The proponent needs to identify in what ways the proposed project violates the Boston Zoning Code and provide an explanation and justification for gaining the zoning relief sought.

The statement (p. 14-1) that virtually no increase in employment is associated with the project should be clarified, for it conflicts with statements made on pages 3-7 and 3-8.

B. Transportation Component

The Access Plan (DPIR Sec. 14) estimates that a total of 2,125 daily vehicle trips will be generated by the new building. However, the Access Plan also states that the great majority of the trips are already being made to the BU campus at various locations; and that the increase of daily trips to the site, as a function of on-site parking rather than building square footage, will be only 228.

The discussion of the number of parking spaces in the area (p. 14-36) should be clarified. More information should be provided on losses and increases in recent years. The Environment Department staff believes that the number of parking spaces proposed should be reduced, especially in light of the close proximity of the Green Line to the site and the proponent's expressed desire to develop an efficient site. Therefore, more detailed information is needed on parking demand management, trip reduction programs, and ride sharing. The demand reduction measures (Section 14.8) to be undertaken by the proponent need to be specified. Also, the discussion of mitigation measures in this section needs to include "vehicle access and circulation" strategies.

The Transportation Access Plan Agreement must take into consideration impacts of the project on traffic flow in Kenmore Square and should resolve the other outstanding traffic and transportation issues associated with the proposed project as well.

The discussion on page 14-49 regarding loading needs to be expanded.

Regarding bicycle transportation (pp. 14-53 and 14-53), clarification is needed as to whether the project will provide bicycle storage facilities.

It is appropriate to take stock of the impacts of BU's entire campus on the transportation system. Therefore a campus transportation master plan should be prepared prior to the renewal of Boston University's Master Plan in 1996. The proposed transportation master plan will show the overall supply and demand relationship to the B.U. campus.

C. Environmental Protection Component

In general, the DPIR has sufficiently described the environmental impacts of the proposed School of Management project and has responded to the scoping requirements. Nonetheless, additional information is needed in the FPIR for the purposes of obtaining additional clarification.

One general observation is that in many sections of the document, especially in the Urban Design chapter, the references in the text to particular figures need further clarification. (For example, the discussion on "Height" (p. 3-10) references Figures 3-1 through 3-4 as illustrating how the project fits into its context. Rather, these figures illustrate facade detailing, not urban context.) The FPIR needs better editing in this respect. Specific comments are described below.

1. Wind

The descriptions contained in the text indicate that the proposed building will create uncomfortable conditions at several locations, including in particular Sherborne Street adjacent to the project, the alley between the project and the existing BU dorm, the "T" pedestrian waiting areas located on the Commonwealth Avenue median, and several locations along Commonwealth Avenue, especially at the building corners. Since the wind analysis included existing landscaping as a mitigation strategy, it is apparent that considerably more mitigation, such as significant additional landscaping, will be required in order to produce acceptable wind conditions. Additional information should also be provided in the FPIR on what type of mitigation strategies will be undertaken to address wind velocities at the MBTA Green Line waiting area along Commonwealth Avenue.

The FPIR should include all available quantitative data that was used to evaluate wind speeds. The text describes both annual and seasonal conditions, but again no specific data are included in the document.

It is assumed that the figures of wind flow patterns (Figures 4-6 through 4-9) represent annual conditions; this should be clarified.

It would be useful for the evaluation to also have the analysis for the other twelve wind directions (even if only in summary) and the relevant data, included in the FPIR, even though only the four wind directions included in the analysis have the greatest influence on increased wind activity.

2. Shadow

For the sake of clarity, it is recommended that the shading for the shadow drawings be reversed, i.e., the existing shadow be in the light gray and the new shadow be in black.

The FPIR should clarify whether all shadows were studied at Eastern Standard Time, or Eastern Daylight Savings Time.

3. Daylight Analysis

The daylight analysis is generally adequate. Commonwealth Avenue is among Boston's widest boulevards, with a right-of-way of 160 feet in this area (and wider in the Back Bay). Because many of the buildings are set back from the property line up to an additional 20 feet, the effective building-to-building distance across some points of Commonwealth Avenue in this area is about 200 feet.

The values obtained for the three vantage points examined in the DPIR were close enough to establish a basis for extended discussion.

4. Air Quality

The carbon monoxide sensing system within the garage will operate to maintain CO levels within the garage below maximum standards. However, the excess CO will be exhausted into the rear alley. The FPIR should indicate the CO concentrations at the exhausts. The location and elevation of the exhaust vents also should be described. Also, the interior garage standards to which CO levels will be maintained should be indicated.

5. Solid and Hazardous Wastes

The hazardous wastes site analysis indicates that some soil and groundwater contamination exists on the site and may require treatment prior to disposal (groundwater) or other site remediation. One soil sample showed particularly high levels of lead, which will require special handling. The text noted that additional testing is on-going. The results of this testing should be included in the FPIR.

More detail should be provided on the remediation plan (soils management) in the FPIR.

The extensive provisions for recycling which will be included in the project are a very positive sign. The building design should incorporate a storage area for recycling programs.

6. Noise

The section on operational noise is generally adequate. The elevation of the "Upper Floor" noise receptors should be specified (Table 7-1). The location and elevation of the garage exhaust and supply fans should be specified (indicate on a floor plan). It would appear as if the garage exhaust and supply fans on the north side of the proposed building have the most potential to impact sensitive receptors. Special care should be taken to ensure compliance from these fans.

7. Geotechnical Impact

Boston University, through its geotechnical consultant shall prepare a plan to address any and all changes in the water table which might occur during construction and after the project has been completed. The plan should be described in the FPIR and also made available to area property owners as a stand alone report. The plan shall be reviewed by the Authority.

8. Construction Impacts

The DPIR is adequate with respect to this issue. Careful compliance with City regulations and with the Projec t Construction Management Plan should adequately mitigate these project impacts.

D. Urban Design Component

The DPIR presented a concept for the proposed School of Management that was identical to the Project Notification Form, a 183 foot high, 366,200 square foot building with an FAR of 7.8. The Scoping Determination expressed concerns that a building of this scale would not be compatible with the existing context and required that the DPIR include appropriate massing studies.

Since the DPIR submission, B.U. has agreed to address the urban design issues by reducing the building height and mass. The result is a reduction of the building's visual impact especially when viewed from Bay State Road and the Charles River Esplanade. Although this height reduction addresses issues raised in the Scope, concerns remain for the proposed Commonwealth Avenue facade and its compatibility to the adjacent structures. The facade details and fenestration pattern tend to accentuate the bulk of the building and the positive efforts to organize the building in a classical manor with a base, middle and top are minimized by the setbacks that were intended to reduce the building mass (p. 3-11). The FPIR should address the impact of the building setbacks and examine alternative detailing and window fenestration that could reduce the perceived building mass. These issues will also be addressed during the BRA Design Review Process.

The following are specific comments regarding the urban design analysis and references in the DPIR and must be addressed and/or corrected in the FPIR.

The Boston University Master Plan was approved by the Boston Redevelopment Authority in 1987. The institutional master plan is an important instrument by which the BRA seeks to ensure that institutional expansion is consistent with approved master plans. The FPIR should include more clarity regarding future use of the remaining portion of Site Q.

The method used to create the perspective renderings distorts the true relationship of the proposal to other context buildings. These perspective renderings should be corrected with particular attention being paid to the height relationships to the context, especially the Project's massing as depicted in Figures 3-8 and 3-9.

E. Historic Resources Component

The Proposed Project can enhance this part of Commonwealth Avenue, just west of Kenmore Square. The building, however, must be in harmony with the surrounding area. The proposed building will form a backdrop to two historic resources: The Bay State Road/Back Bay West Architectural Conservation District, a designated local landmark also listed on the State Register of Historic Places, and the Charles River Basin, listed on the National Register as well as the State Register of Historic Places. We note that the Bay State Road district immediately abuts the Proposed Project site to the north and is characterized by the late 19th- and early 20th-century brick townhouses three-five stores in height. Specific comments follow:

The School of Management Building is compatible with its surroundings in terms of materials and colors. The ground floor treatment will have a positive streetscape impact and the building footprint greatly strengthens the streetwalls along Commonwealth Avenue and Sherborne Street. The proposed modifications to the building scale, height, and massing represent a good faith effort to address the urban design concerns raised during the review process. The FAR for the proposed building has been reduced from 7.8 to 6.5. The size of the building has been reduced from 366,000 gross square feet to 321,700 gross square feet and the number of stories has been reduced from ten to nine.

Historical research and geotechnical studies of the project area indicate that the eastern portion of the site contains undisturbed marine deposits below the historic landfill. The Boylston Street Fishweir Site, listed on the National Register of Historic Places, is located approximately one mile east of the site. There is therefore some likelihood that archaeological deposits are present at this site, such as the remains of a prehistoric fishweir. Due to the extreme depth of the marine deposits at the site, archaeological testing and mitigation programs, coordinated with the construction schedule, should be reviewed in consultation with the Boston Landmarks Commission and the Massachusetts Historical Commission.

F. Infrastructure Systems Component

The infrastructure analysis contains enough information to conclude that no significant impacts on existing utility infrastructure systems occur as a result of the proposed project. However, this reassurance is contained to a large degree in letters and telephone memoranda from the utilities in question, as well as basic use/generation calculations using standard criteria. For a project of this size, it is most helpful to have the use and generation figures compared to line capacities (notably for water, sewage, and storm drain systems) and those line flows traced to trunk lines or major interceptors. It is difficult to ascertain whether a more limiting diameter sewer pipe segment downstream, for example, might reach a worrisome percentage of design capacity. Also, the age of the 16" water main ("PCI" construction should be identified) on Commonwealth Avenue is 100 years; its condition should be researched and this segment replaced if necessary or prudent.

On page 13-5 the electrical load for the project is given as 3,850 kw (first paragraph of Section 13.7), whereas Table 13-1 indicates 3,580 kw. Which is correct?

G. Landscaping

More clarification is needed regarding landscaping. On page 13-5 (third paragraph of Section 13.6) it is stated that up to 20% of the site will be landscaped following project completion. Figure 3-5 shows considerably less of the site will be landscaped.

II. AGREEMENTS

In addition to completing the Development Review Requirements process, the agreements and plans listed below must be provided in form and content satisfactory to the relevant signatory public agencies before building permits shall be issued for the project.

A. Development Impact Project (DIP) Plan and Agreement including provisions for a Housing Contribution Grant and Jobs Contribution Grant pursuant to Articles 26A and 26B of the Code;

B. PDA Development Plan pursuant to Section 3-1A of the Code;

C. Cooperation Agreement;

D. Transportation Access Plan (TAP) Agreement;

E. Traffic Maintenance Plan in conformity with the City's Construction Management Program;

F. Boston Residents Construction Employment Plan, pursuant to Chapter 12 of the Ordinances of 1986 of the City of Boston, as amended by Chapter 17 of said Ordinances, and Executive Order Extending Boston Residents Job Policy, signed by the Mayor on July 12, 1985; and

G. First Source Agreement with the Mayor's Office of Jobs and Community Services.

2.0 PROJECT DESCRIPTION

2.0 PROJECT DESCRIPTION

2.1 INTRODUCTION

The purpose of this chapter is to provide a description of the new School of Management project site's existing conditions; the design objectives for the Project; and the proposed building uses and design elements. The Project, originally envisioned as a ten story building, now is proposed to be a nine story building. A comparison of the two alternatives is included, but the primary focus is on the nine story alternative. Since the overall concepts remain the same for both alternatives, not all sections require a discussion of both alternatives. See Chapter 3.0, Urban Design, for additional information on the Project design concepts and urban context.

2.2 SURROUNDING AREA

The new School of Management site is located in the heart of Boston University's Charles River Campus near the Kenmore Square area at the northeast corner of Sherborn Street and Commonwealth Avenue and across from the Arthur B. Metcalf Center for Science and Engineering. It is bounded by the Howard Johnson's Motor Lodge to the east, a University dormitory which houses over 500 students to the north, mixed commercial and educational uses along Commonwealth Avenue to the south, and the School of Education across Sherborn Street to the west. The buildings in the area contain a mix of commercial, academic, and residential uses. The site is adjacent to the Bay State Road-Back Bay West Historic District to the north where the University owns and occupies over one million square feet of space used for offices, faculty residences, and housing for over 2,800 students. The University owns all properties abutting the Project site and the majority of buildings in the vicinity, including those along Bay State Road. Within a five minute walk of the Project site are facilities which contain five University colleges (Sargent College, College of Communications, College of Engineering, College of Liberal Arts, and School of Education), a 1,500 bed dormitory (Warren Towers), and the Boston University Bookstore Mall. Since 1980, the University has invested over $206 million in capital improvements within this area alone.

The area around the Project site is characterized as an urban campus including several small urban open spaces near the site, one brick and concrete plaza across Commonwealth Avenue (in front of the Metcalf Center and the College of Communications), and a narrow park located behind the site across the alley next to the dormitory on Bay State Road. Within approximately 500 feet of the site is the south bank of the Charles River which offers public recreational biking, walking and picnicking. This part of the River is included in the Charles River Basin historic district. The Project site is in close proximity to Kenmore Square, an intensely commercial area.

2.3 EXISTING CONDITIONS

The Project site, a rectangular parcel of approximately 49,686 square feet, is currently used by the University as surface parking for 181 cars. There are two small wooden parking attendant booths on the site, and a small landscaped area at the southwest corner. Two retaining walls varying in height from 1 to 2 feet bound the north and east property lines. The site is located along the north side of Commonwealth Avenue between Deerfield and Sherborn Streets and extends back from Commonwealth Avenue to an alley. It is relatively flat with the elevation varying from approximately 18 feet (Boston City Base) on the north side, to 20.5 feet on the south side. Conditions at the site can be seen in Figure 2-1, Topographic Site Survey. Existing conditions of the Project site are shown in Figures 2-2 through 2-8.

2.4 PROJECT OBJECTIVES

2.4.1 SUMMARY OF GOALS

The overall goals of the new School of Management project are to upgrade and consolidate the current School of Management facilities including some executive administrative space. The Project is also designed to significantly improve pedestrian safety, create desirable urban features, and enhance economic opportunity for Kenmore Square area business.

The following is a summary of benefits relating to safety and urban design in addition to academic space needs which will result from the new Boston University School of Management project.

- Improve the quality of the School of Management through updated facilities which respond to state-of-the-art teaching techniques and curriculum.
- Consolidate academic and some administrative activities on campus.
- Contribute to the vitality and safety along sections of Commonwealth Avenue.
- Satisfy urban design objectives by filling the visual gap presented by existing site uses and create a continuity of buildings.
- Provide a visual gateway at the eastern end of the Commonwealth Avenue campus.
- Provide pedestrian improvements including new landscaped areas, streetscaping elements, and a reduction in curbcuts from five to one.
- Improve pedestrian and traffic safety through consolidated class locations and reduce pedestrian trips along and across Commonwealth Avenue between classes.
- Enhance commercial markets for Kenmore Square businesses.
- Contain development within Master Plan growth corridor.

The Project concept is shown in Figure 2-9. Urban design issues are fully discussed in Chapter 3.0, Urban Design. Project benefits are also discussed both in Chapters 1.0, Project Summary and later in this chapter.

2.4.2 SCHOOL OF MANAGEMENT GOALS

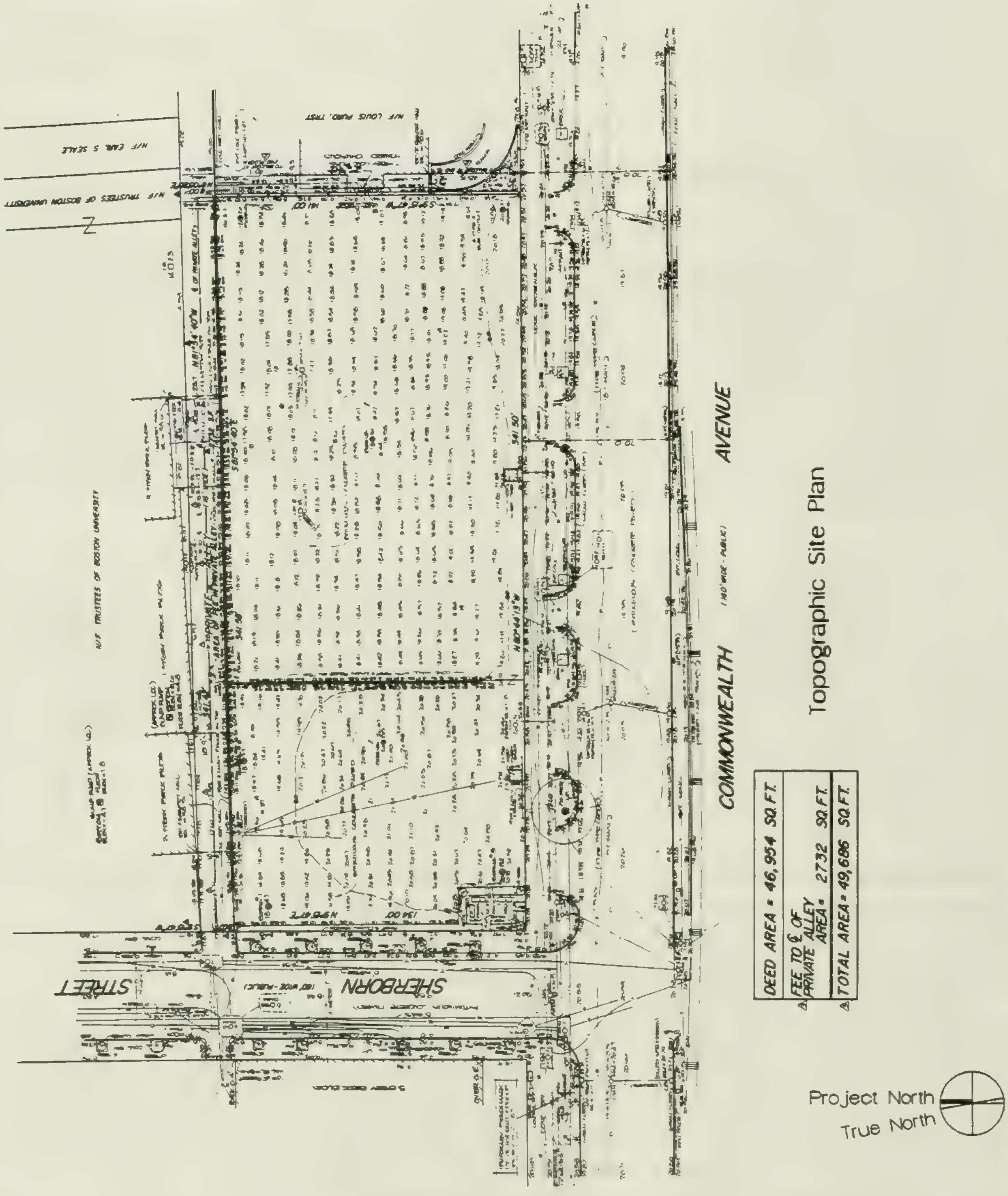
The current management program at Boston University is an old established program of study, as described in the Background section of Chapter 1.0, Project Summary. In order for the School of Management to maintain its competitive edge within the national student pool and remain competitive with management programs offered at other schools and universities, it is necessary for the School of Management to continue to improve and upgrade its facilities. The Boston University School of Management is currently scattered in six locations along Commonwealth Avenue in antiquated 60-year old buildings. It is impossible to create and implement highly technological and innovative programming in these older facilities. The University is responding to today's challenge with the following two-fold action plan.

1) Update the School of Management program to offer an innovative approach to its management curriculum, thus promoting integrated, high technology programming while incorporating the Leadership Institute (currently located in Tyngsboro, MA).
2) Develop state-of-the-art facilities which physically allow consolidation and integration of programs which require high technology equipment; attractive facilities including updated library, lecture hall, case study rooms, and breakout rooms; and computer facilities.

2.4.3 EXECUTIVE ADMINISTRATION AND PARKING GOALS

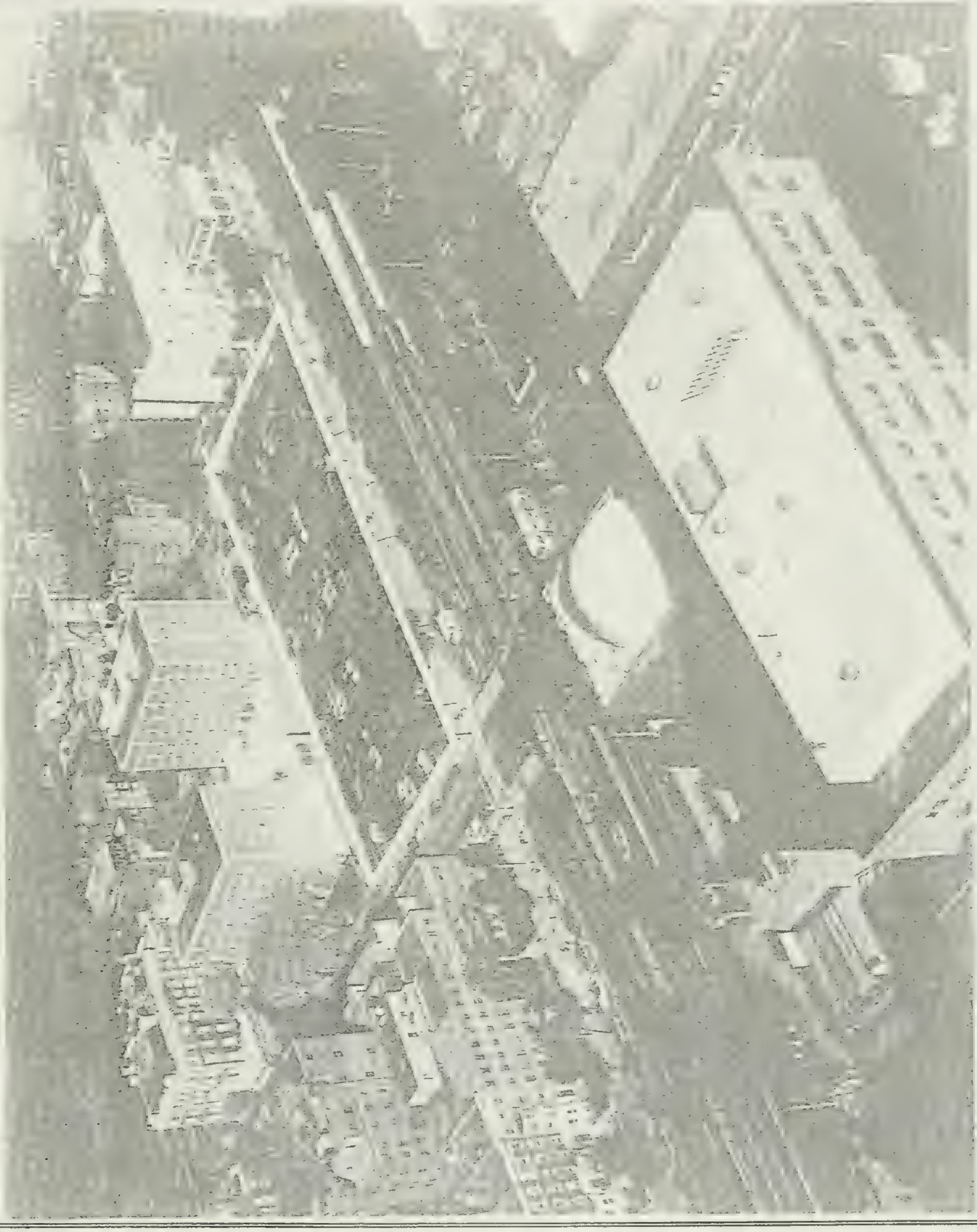
Executive administrative space on the Charles River Campus is also scattered throughout campus in antiquated facilities which cannot easily be upgraded or updated to accommodate today's technology. The Project will fully address the School of Management needs and partially provide improved operations of executive administration functions.

The Project also includes enough parking on-site to service activities in the building. The number of spaces balances the need to serve activities within the Project, yet encourage alternative modes of transportation such as public transit, bicycling, and walking. Because other parking facilities in the area are currently at capacity, it is important that the Project include enough parking on-site so adjacent neighborhoods will not be overburdened by activities associated with the Project. Chapter 14.0, Transportation includes a detailed parking analysis.



Topographic Site Plan

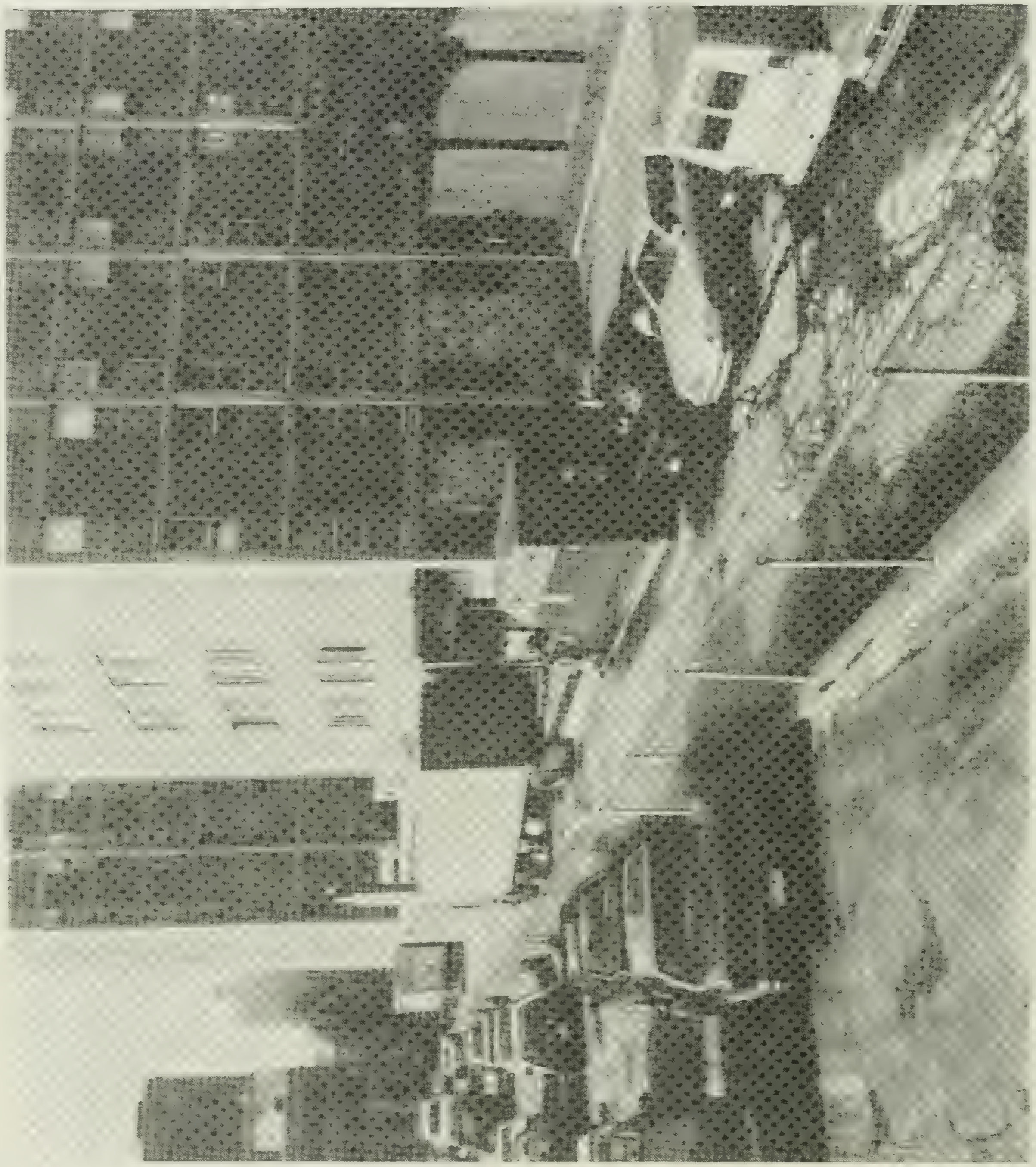
Prepared By: Cannon	***Figure 2-1***



Existing Project Site

Prepared By:
Cannon

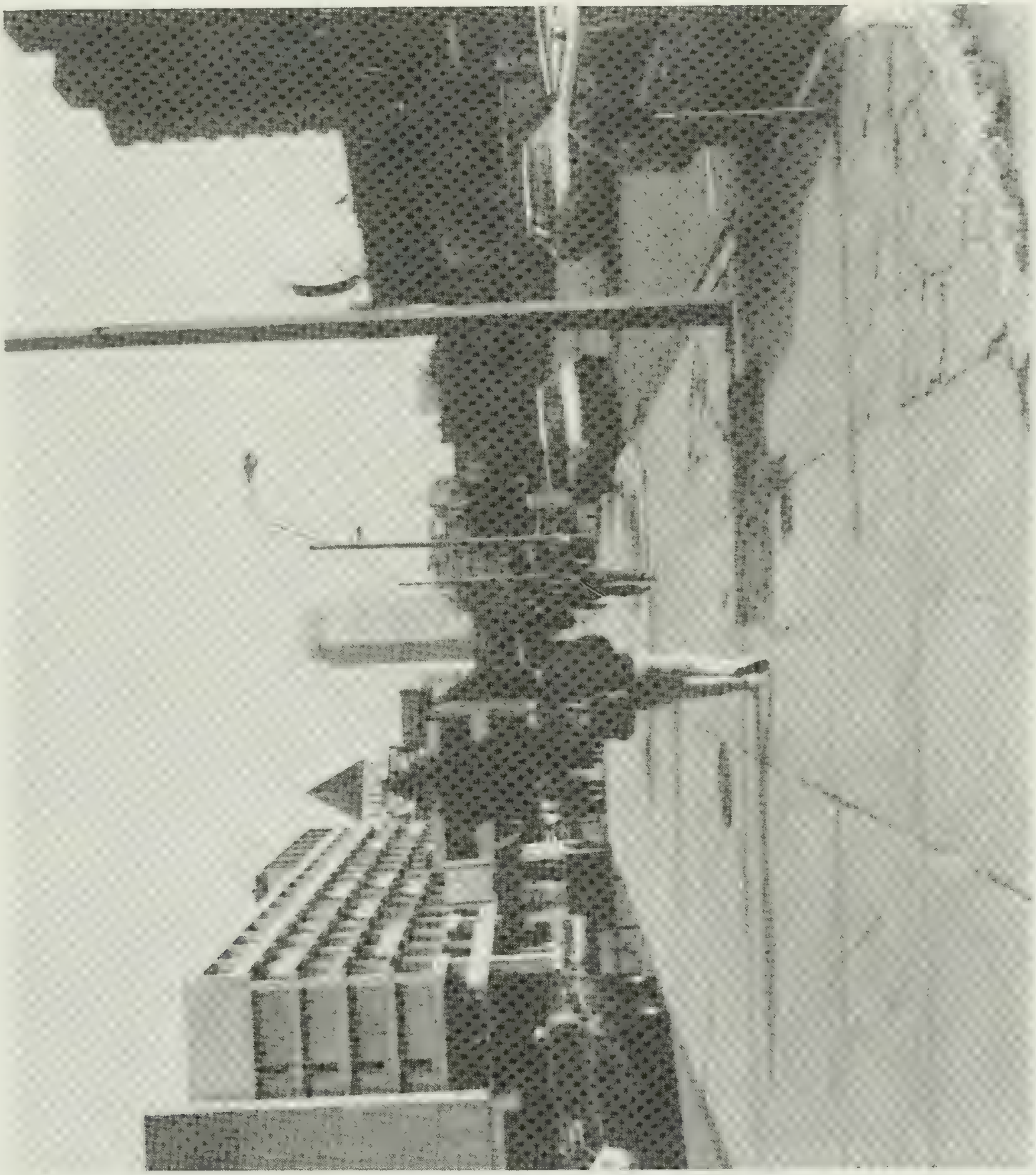
Figure 2-2



Existing Site - Alley Looking West

Prepared By:
Cannon

Figure 2-3



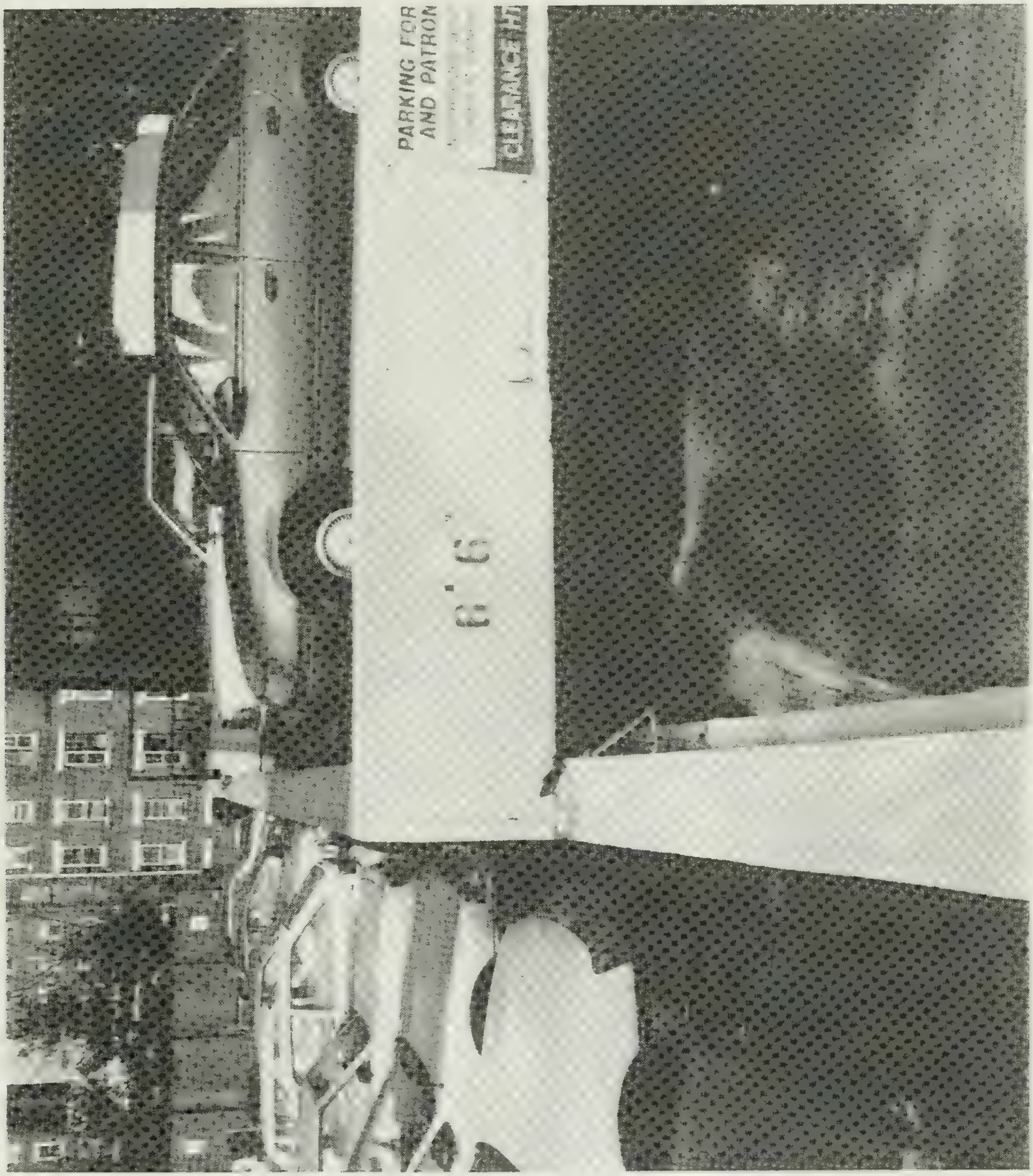
Existing Site - Commonwealth Avenue Looking East

Prepared By:
Cannon

Figure 2-4

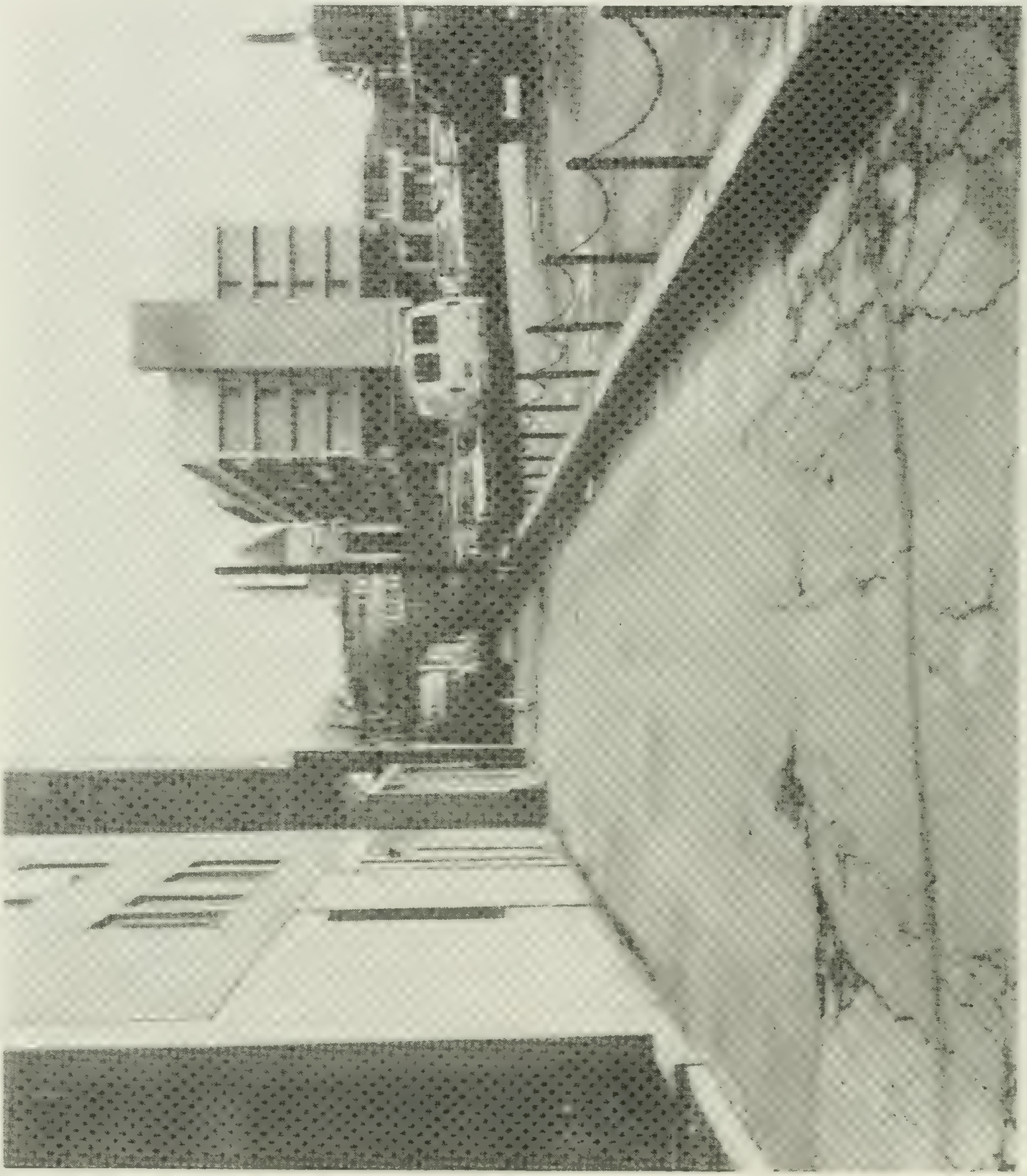
Existing Site - Sherborn Street Looking North

Prepared By: Cannon	***Figure 2-5***



Existing Site - Howard Johnson's Motor Lodge to the East

Prepared By: Cannon	***Figure 2-6***



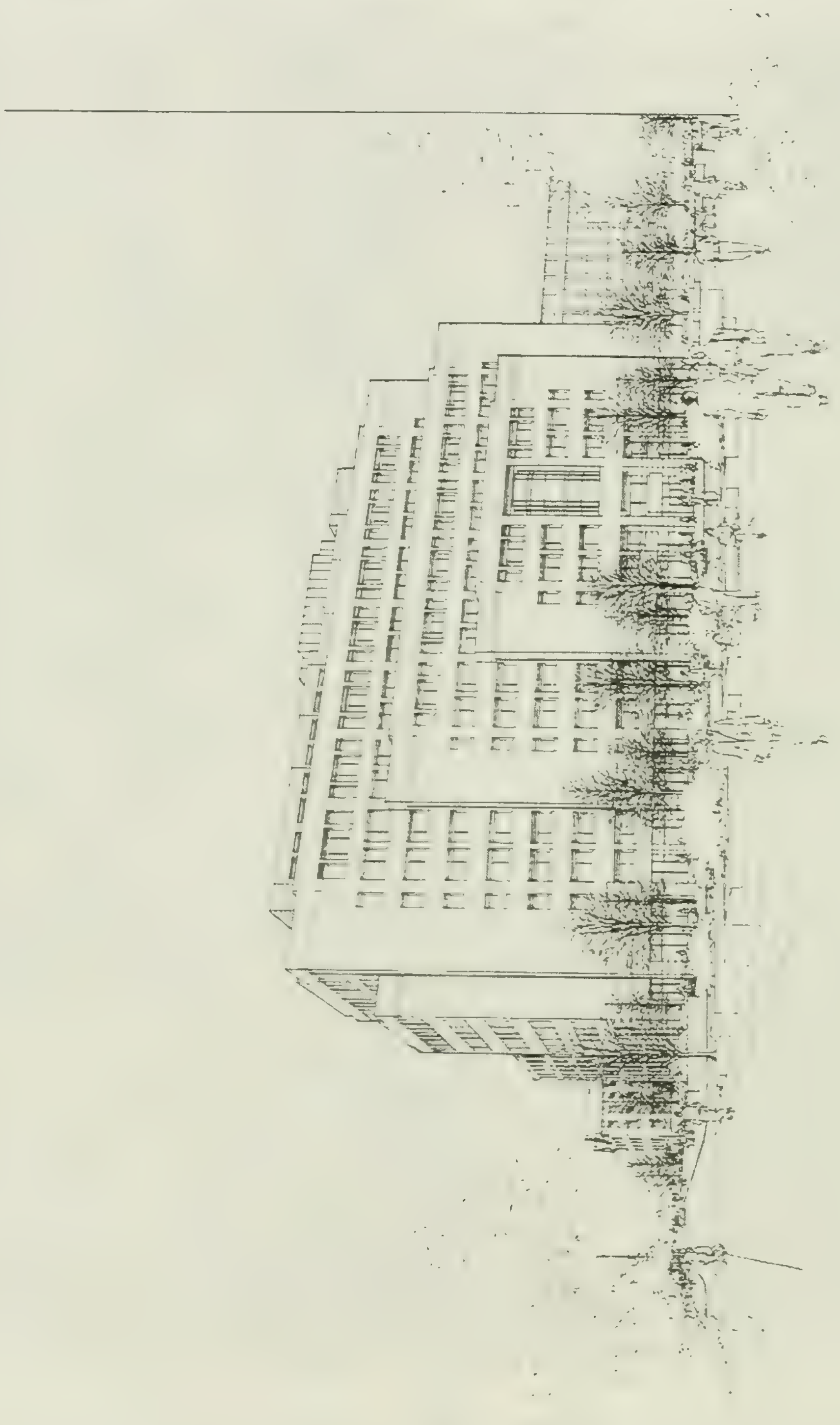
Existing Site - Alley Looking East

Prepared By:
Cannon

Figure 2-7

Existing Site - Commonwealth Avenue Looking West

Prepared By: Cannon	***Figure 2-8***



Building View from Commonwealth Avenue

Building Perspective

Prepared By: Cannon	***Figure 2-9***

2.5 PROJECT DESCRIPTION

2.5.1 BUILDING PROGRAM

The ten story School of Management building contained approximately 366,000 square feet of gross floor area with an atrium in the core of the building. The ten story building had a footprint of approximately 38,000 square feet and was approximately 183 feet high including a mechanical penthouse of approximately 23 feet. The building program also included 270 parking spaces in three levels below grade.

The nine story project retains the 38,000 square foot footprint and 270 parking spaces in three levels below grade. The building program has been reduced by 11% to approximately 321,700 square feet and the Floor Area Ration (FAR) is now 6.5. The total height of the building has been lowered over 18 feet. It is now approximately 150 feet to the top parapet with the mechanical penthouse reduced to approximately 21 feet. The overall Project concept and orientation remain the same. A site plan is shown in Figure 2-10.

Similar to the ten story alternative, the first six floors of the nine story alternative will be dedicated to the new School of Management and contain approximately 221,400 square feet of gross floor area comprising approximately 70% of the building. Within the new facility, there will be a lecture hall with an estimated 400 seats, classrooms, seminar/conference and case-study rooms, computer labs, a library with approximately 310 seats, office space for School of Management faculty and administrators, research institutes and staff, and a 170-seat canteen and executive education center.

The remaining floors of the nine story alternative, seven through nine, will contain approximately 100,300 square feet of gross floor area set aside for executive administration offices and Board Room facilities. This program reflects a reduction of approximately 39,000 square feet, 28% of executive administrative space from the ten story alternative.

Separate identities for the School of Management and executive administration will be defined through the two entrances to the building. The new School of Management entrance is located on Commonwealth Avenue while the entry to the executive administrative offices is situated along Sherborn Street.

The Project size and massing are determined by the School of Management program needs described above. The building design also includes the atrium and provides an adequate area for structured parking in below-grade levels. The base of the building is aligned with building edges toward Kenmore Square at the east and steps back to align with the buildings to the west setback from the sidewalk. This design further serves to reduce the massing impact. A lightening effect is further created through the recessed entry and the use of a limestone color pre-cast material.

The design of the building features an enclosed atrium extending from the ground floor through the six School of Management floors. This reflects the new program objectives by allowing visual contacts and encouraging community interaction within the school. At the ground floor, the atrium feature also provides areas for informal gatherings. Figures 2-11 through 2-14 show representative floor plans. Table 2-1 shows the building area by floor.

The building's facade employs warm red brick with fabricated limestone color pre-cast materials which reinforce the architectural signature of the campus. Granite is used to define the base of the building at the ground level. The facade design offers a lively rhythm of solids and voids with emphasis on the projecting volume as the identifying element of the Project. Figures 2-15 and 2-18 show typical elevations. Additional discussion of design concepts can be found in Chapter 3.0, Urban Design.

2.5.2 LANDSCAPING PLAN

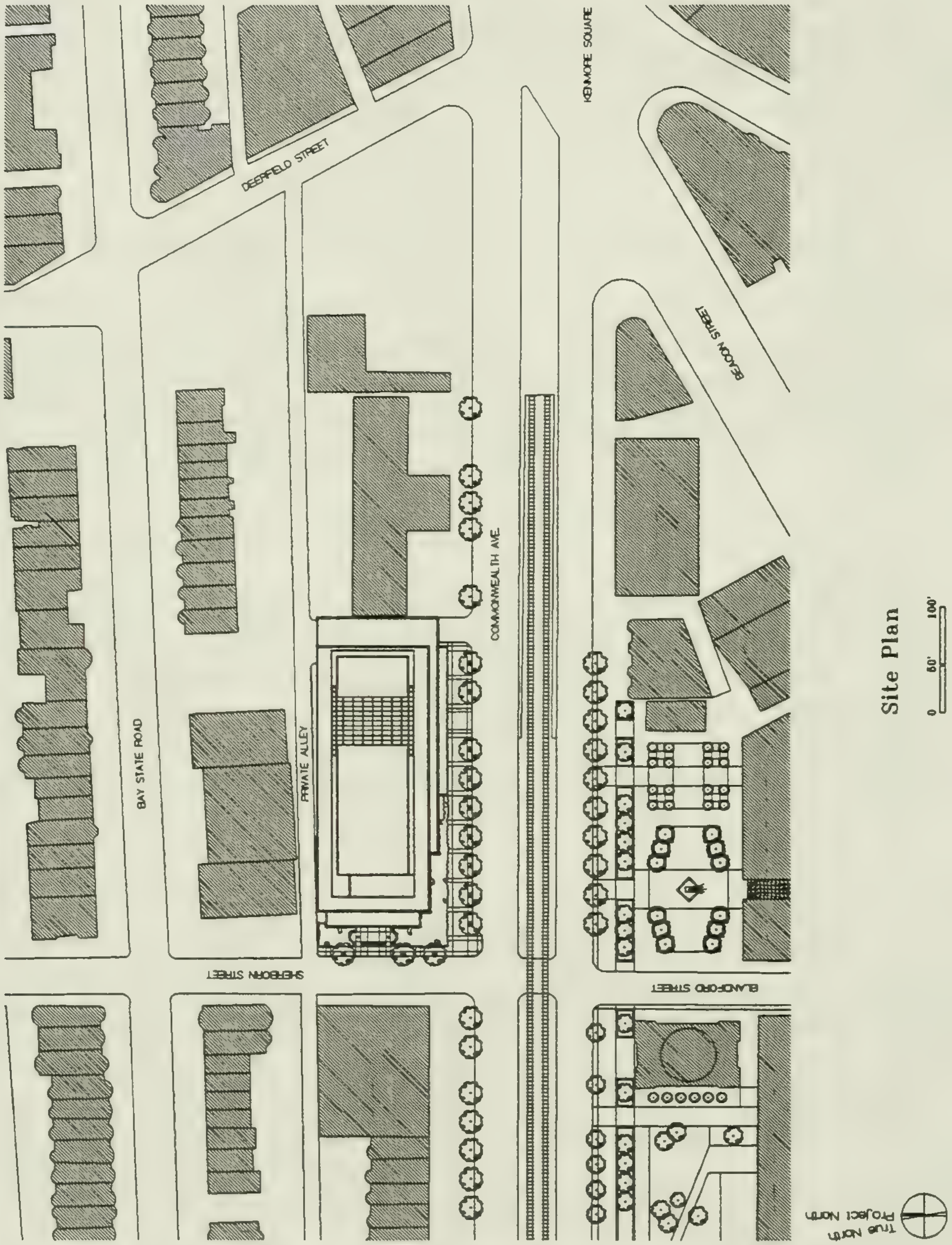
At the pedestrian level on both Sherborn Street and Commonwealth Avenue, the proposed treatment of the site from building edge to curb divides the space into three areas: sidewalks coinciding with existing sidewalk widths; a raised planting area wrapping around the southwest corner between the sidewalks and the building; and an entrance plaza serving the administrative offices. The plan has been modified and augmented to provide relief from potential wind impacts (see Chapter 4.0, Wind) and further enhance the Project. The landscape plan can be seen in Figure 2-19.

Sidewalk Treatment

The sidewalk treatment will be upgraded to brick paving with the addition of large street trees along the curb to be more consistent with the newer sidewalks. The shade trees will be aligned with the building bays to tie the facade to the sidewalk space. This treatment will also define the street edge and emphasize the School of Management entrance. Long concrete planters will be located between the street trees to separate vehicular and pedestrian traffic and to discourage jaywalking. Street lighting and furniture including trash receptacles, bicycle racks, and granite seating will enhance the campus quality of the space.

Table 2-1
Building Program Summary (Nine Story)

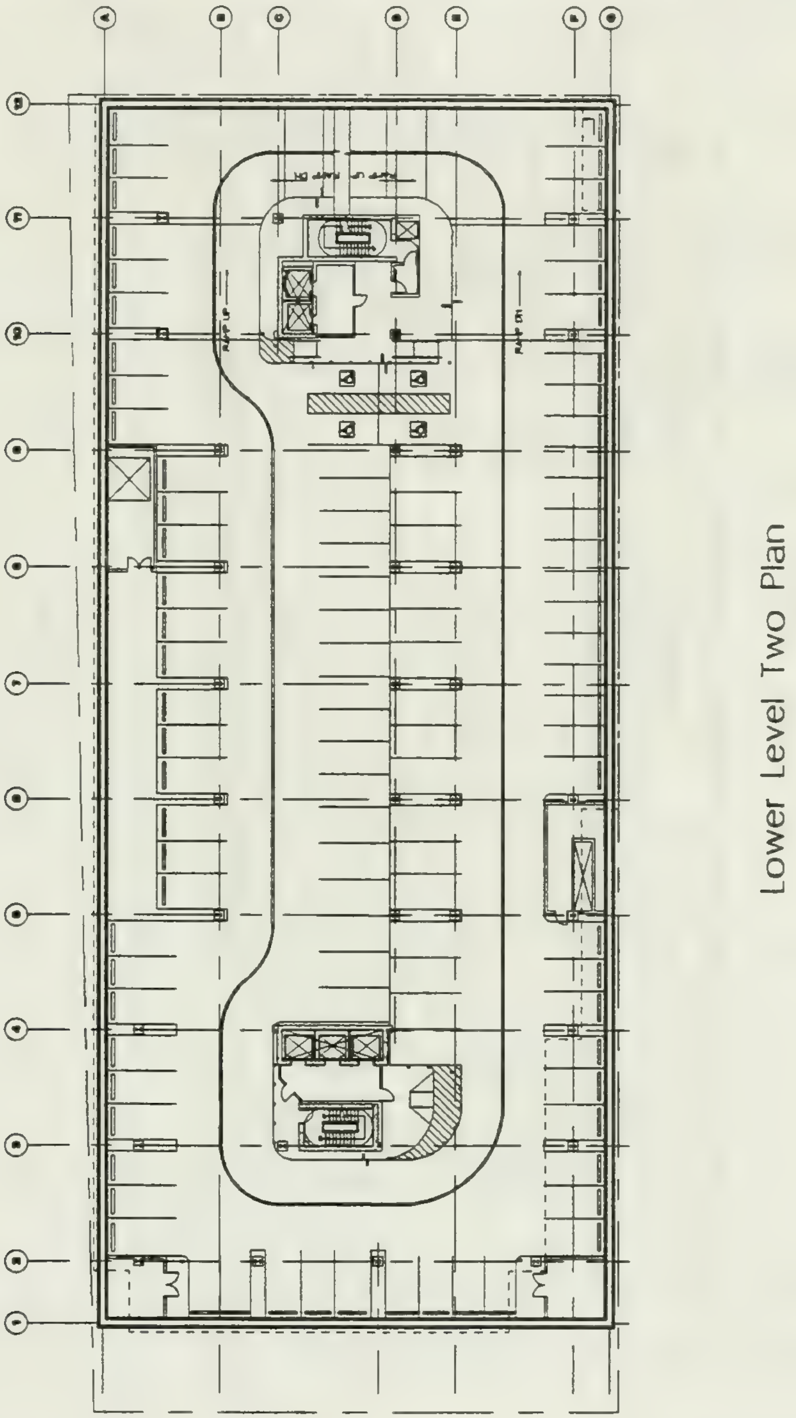
SCHOOL OF MANAGEMENT		
	Gross Square Feet (rounded)	
Garage	**3,200**	
Media		
Computer		
Miscellaneous Support		
Ground Floor	**36,200**	
Lecture Hall		
Graduate Program Administration		
Career Planning/Placement		
Undergraduate Program Administration		
Floor 2	**35,500**	
Library		
Canteen		
Student Government/Lounge		
Classrooms		
Floor 3	**37,000**	
Library		
Student Lounge		
Classrooms		
Floor 4	**37,100**	
Library		
Executive Education Center		
Classrooms		
Floor 5 Faculty Offices	**36,900**	
Floor 6 Faculty Offices	**35,500**	
SUBTOTAL		**221,400**
EXECUTIVE ADMINISTRATION		
Floor 7 Offices	**38,300**	
Floor 8 Offices	**31,000**	
Floor 9 Offices and Board Room	**31,000**	
SUBTOTAL		**100,300**
TOTAL		***321,700***
Mechanical Penthouse	**18,800**	
Below Ground (3 levels)	**122,100**	
Parking/Mechanical		
Storage		
Operations Areas		
Source: Cannon		



Site Plan

Prepared By:
Cannon

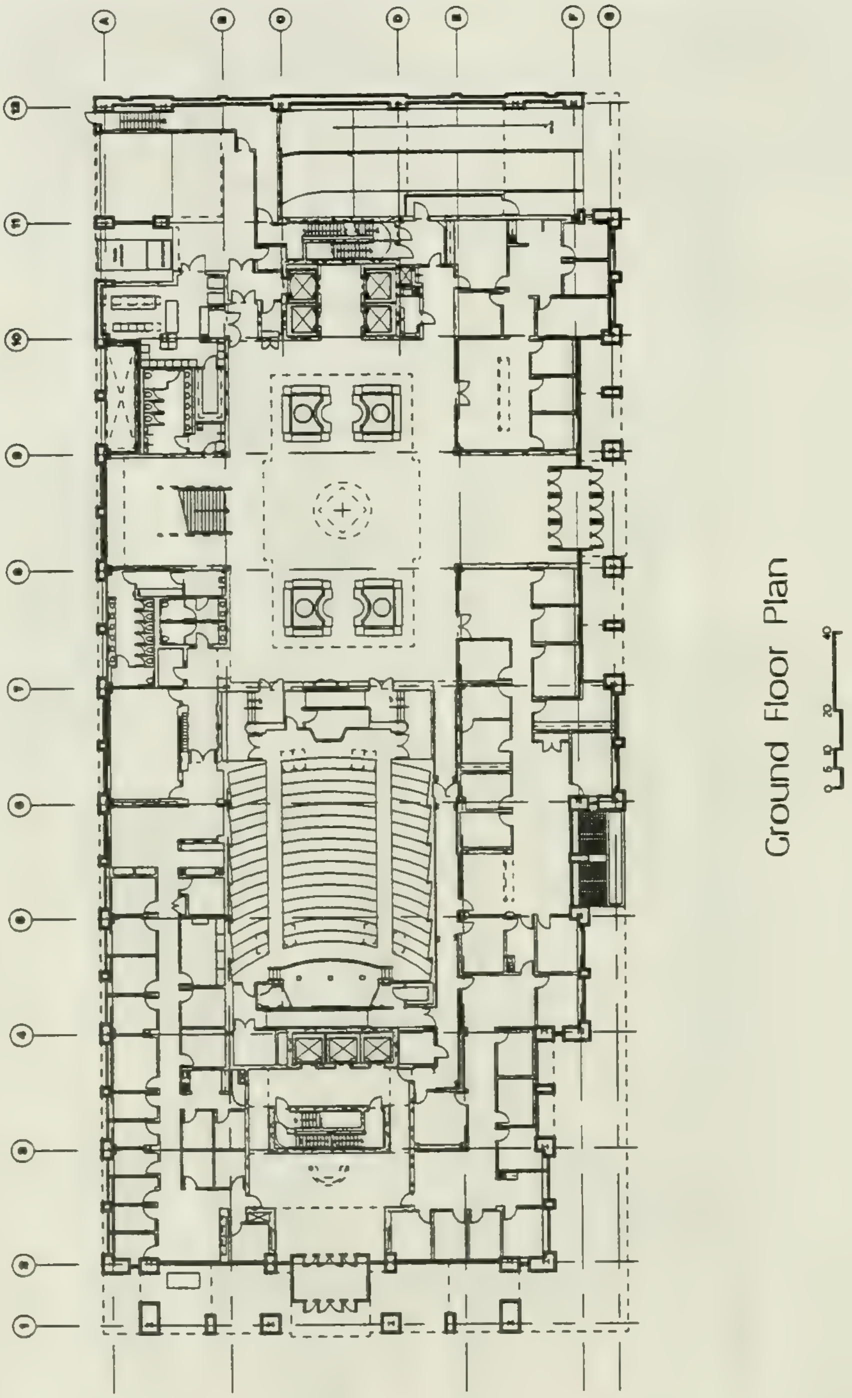
Figure 2-10



Typical Parking Level Plan

Prepared By:
Cannon

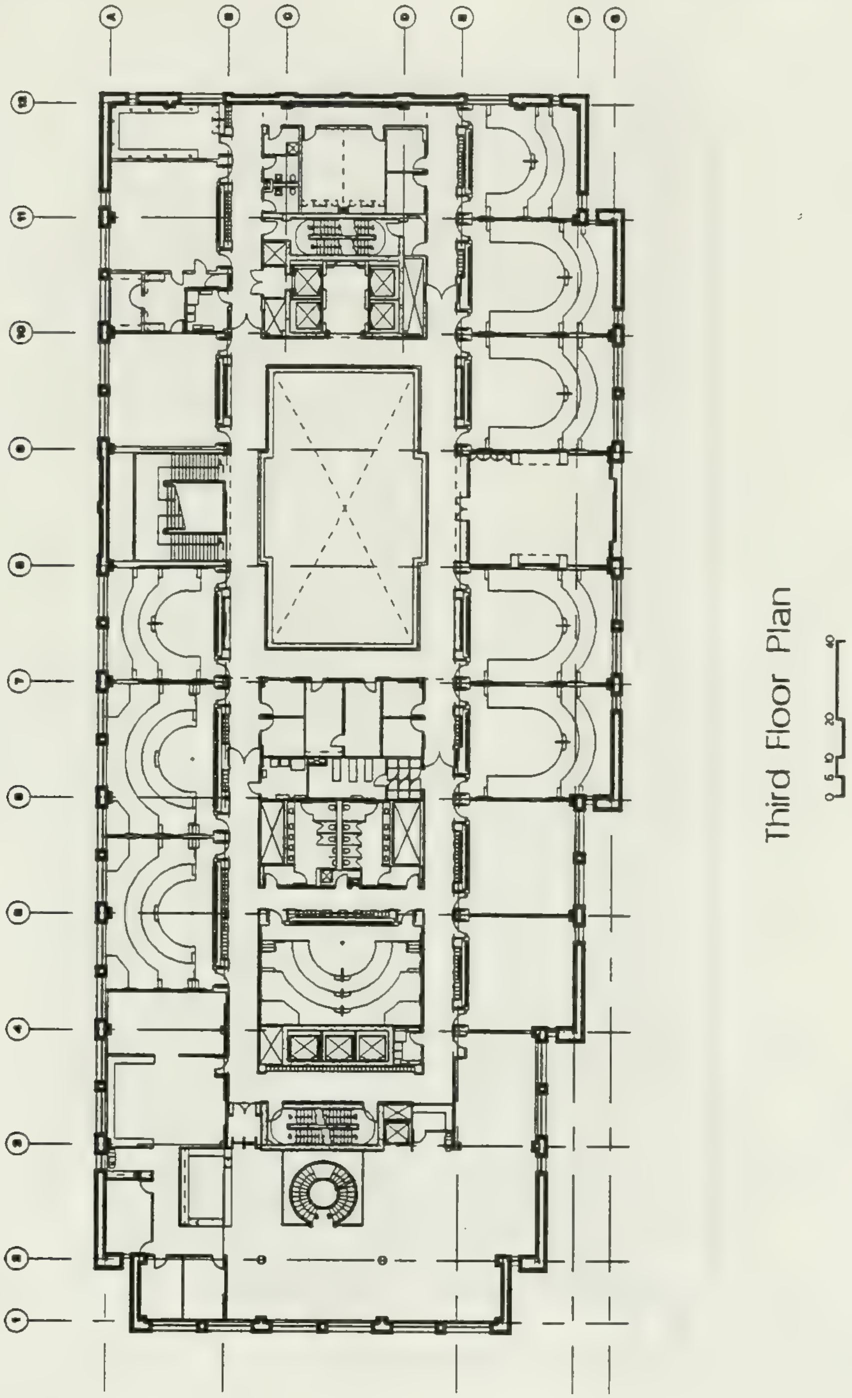
Figure 2-11



Entry/Ground Floor Plan

Prepared By:
Cannon

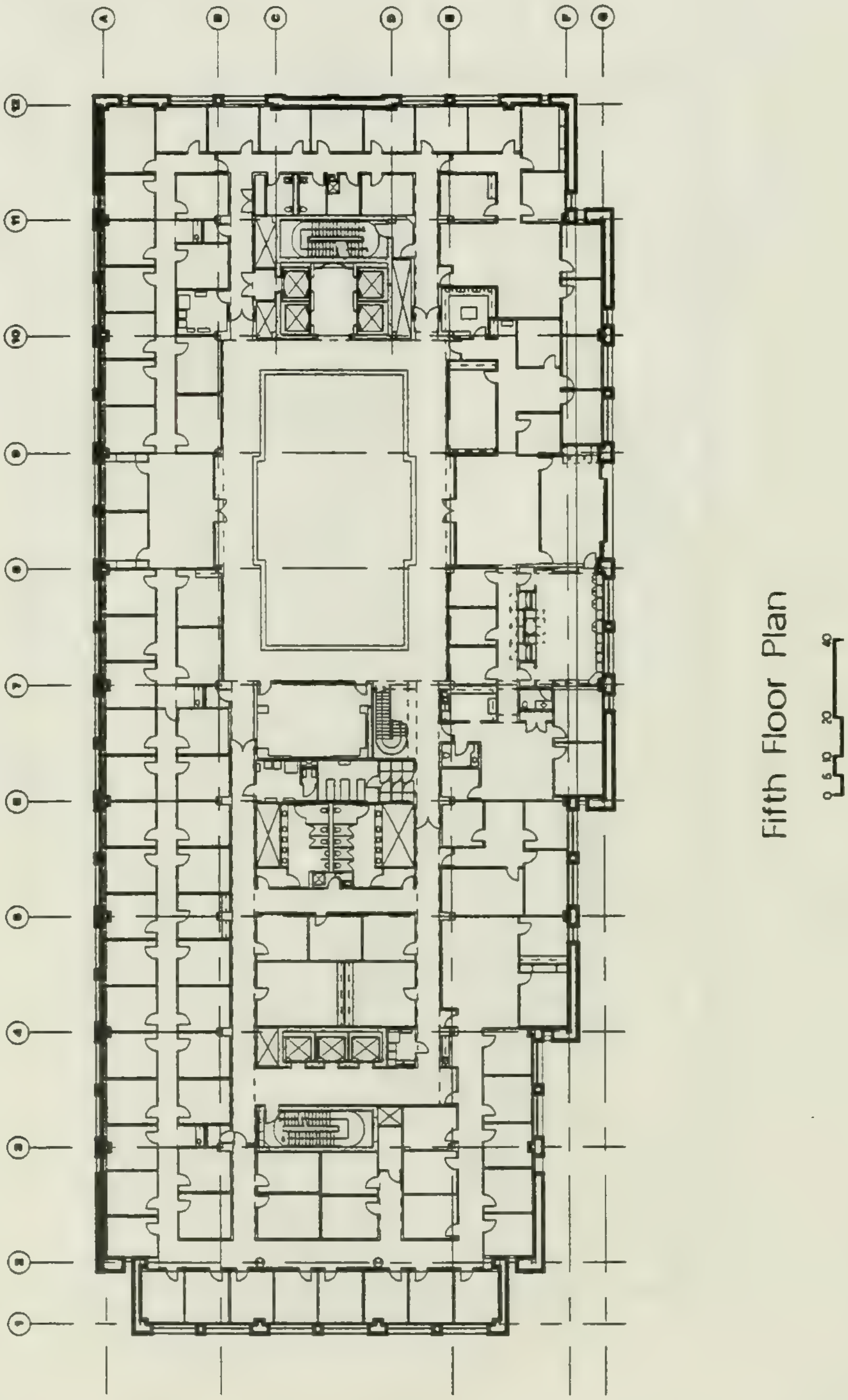
Figure 2-12



Typical Classroom Floor Plan

Prepared By:
Cannon

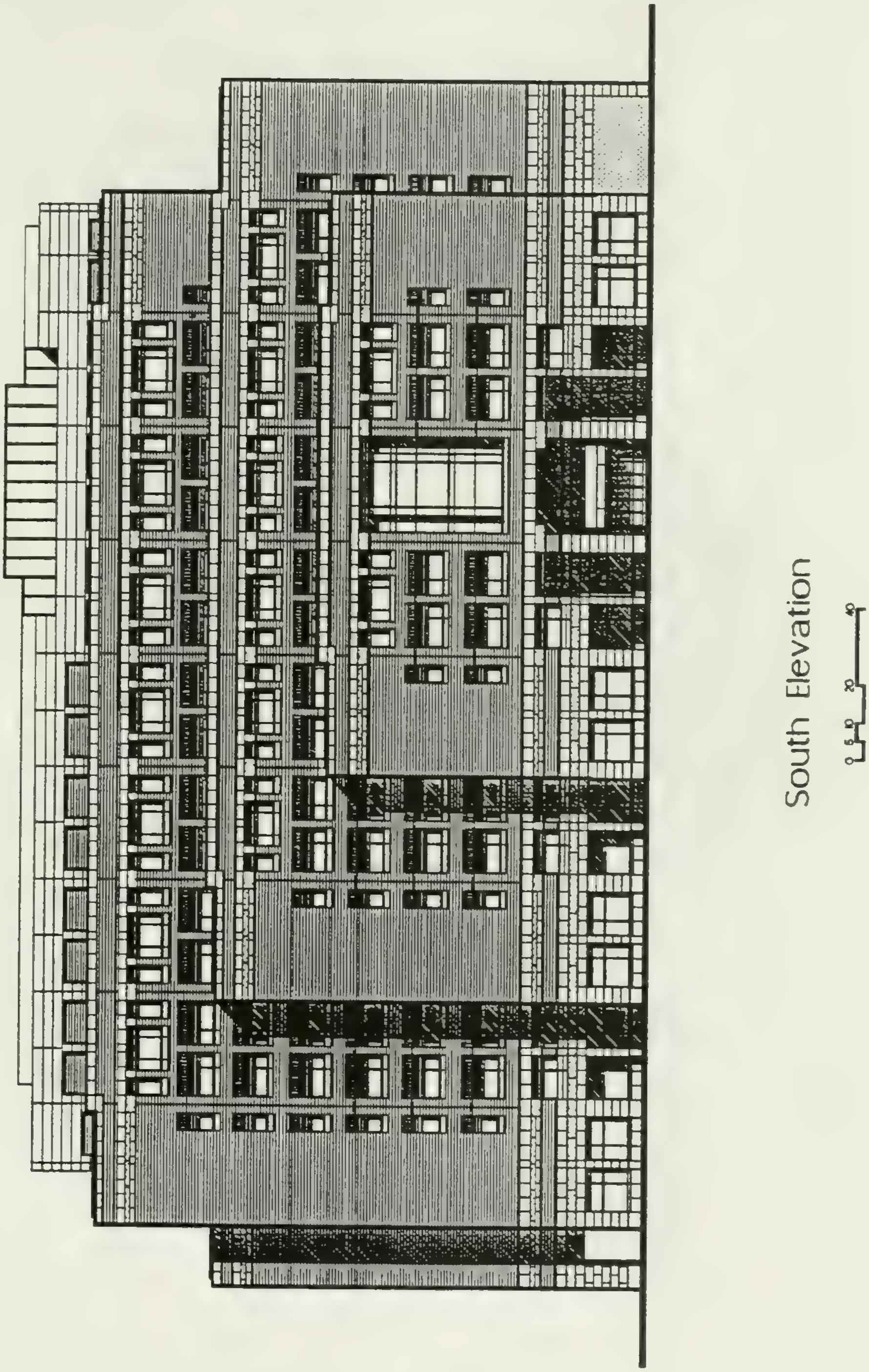
Figure 2-13



Typical Administration Floor Plan

Prepared By: Cannon

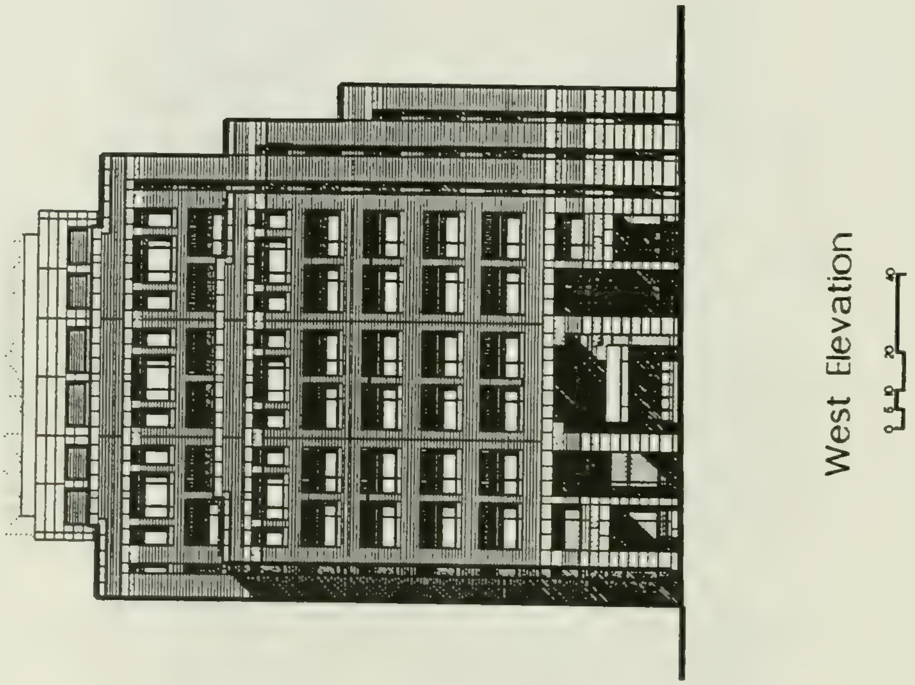
Figure 2-14



Commonwealth Avenue Elevation

Prepared By: Cannon

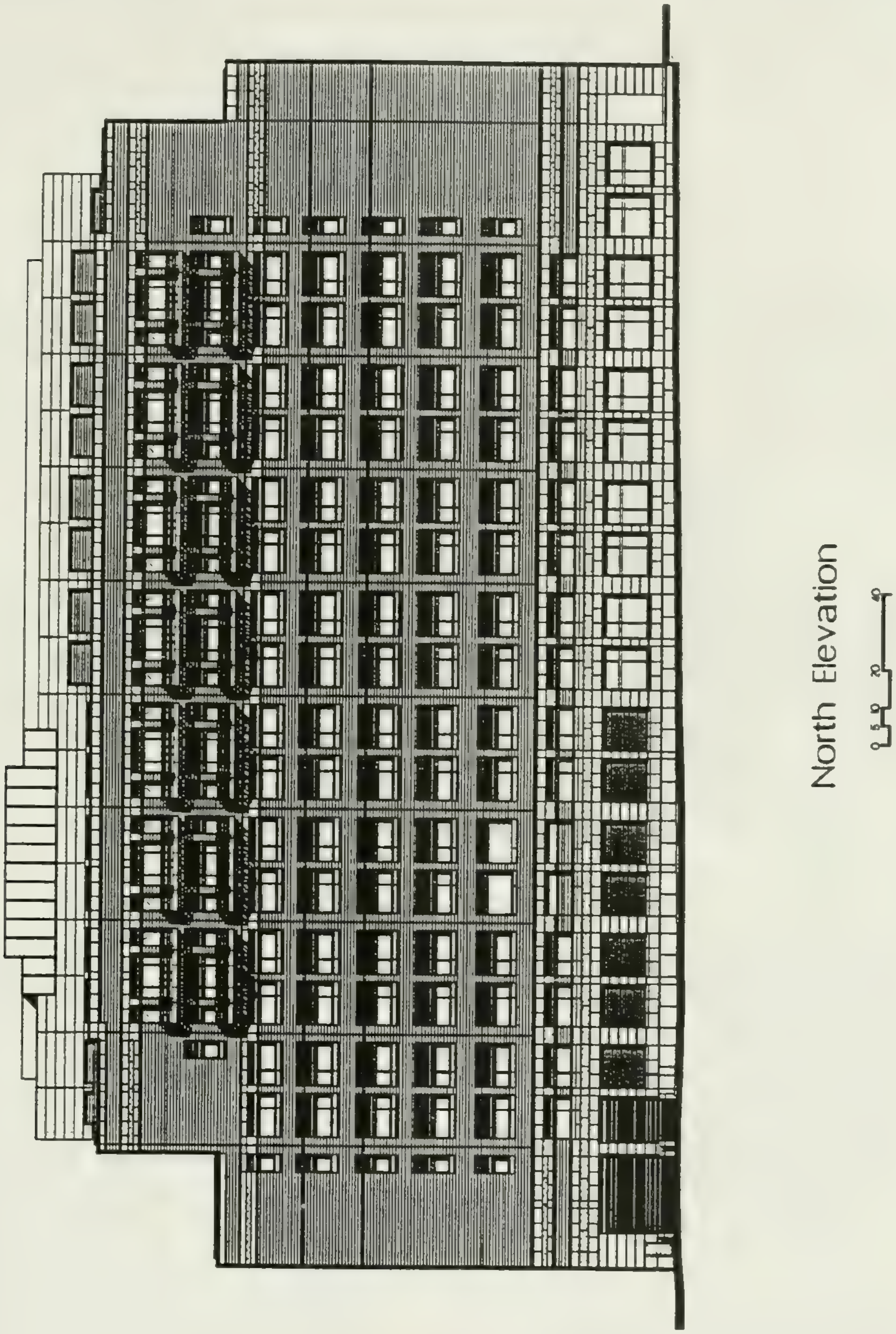
Figure 2-15



Sherborn Street Elevation

Prepared By:
Cannon

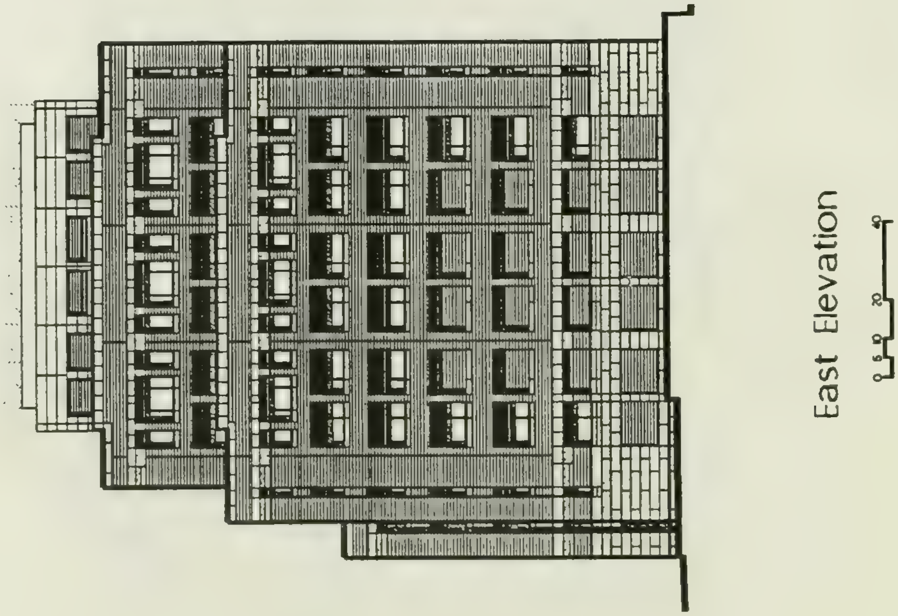
Figure 2-16



Private Alley Elevation

Prepared By:
Cannon

Figure 2-17



Elevation Adjacent to Howard Johnson's Motor Lodge

Prepared By: Cannon	***Figure 2-18***

Reconstruction of the curb and sidewalk will have the added benefit of eliminating four curb cuts along Commonwealth Avenue and adding a neckdown at the Sherborn Street intersection. The proposed neckdown will improve pedestrian safety by minimizing the crosswalk width. The proposed crosswalks will be paved with brick and granite edging.

Administration Entrance Plaza

Aligning the Sherborn Street grade level facade of the new building with the facade of the dormitories to the north has created an opportunity to include a formal courtyard leading to the entrance of the executive administration. The brick and granite courtyard is raised several steps above the sidewalk and features two circular granite sitting areas. Access for persons who cannot negotiate the steps will be possible by a walk north of the steps which loops back along the facade of the building.

Plant Bed

The planted area will feature large deciduous and evergreen trees, flowering accent trees, shrubs, groundcover, and lawn. It will be separated from the sidewalk by a raised granite curb. The curb treatment and planting area will serve as a front yard which mirrors the setback treatment at the School of Education building immediately across Sherborn Street to the west..

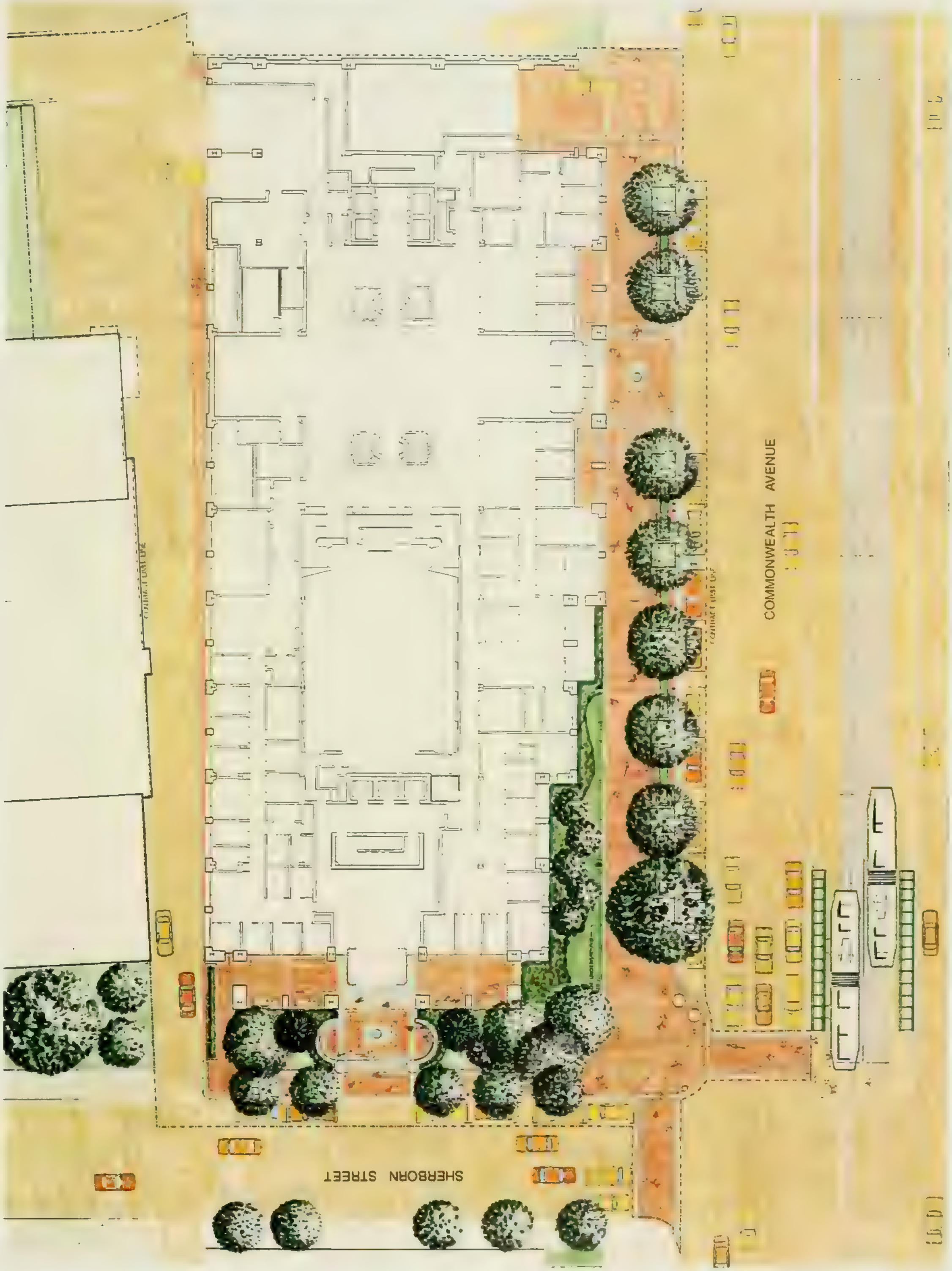
2.5.3 SITE ACCESS

Pedestrian

The Project will have two entrances: the first entrance (the main entrance) leads into the new School of Management lobby; the other entrance leads to the executive administrative offices. The main entrance will be for School of Management faculty, personnel, and students. This entrance is prominently located on Commonwealth Avenue entering into the lobby and atrium and serves the first six floors of the building containing the School of Management and executive education center. The separate entrance for the executive administration offices is provided on Sherborn Street in order to avoid conflict or confusion between building users or visitors.

Parking and Service

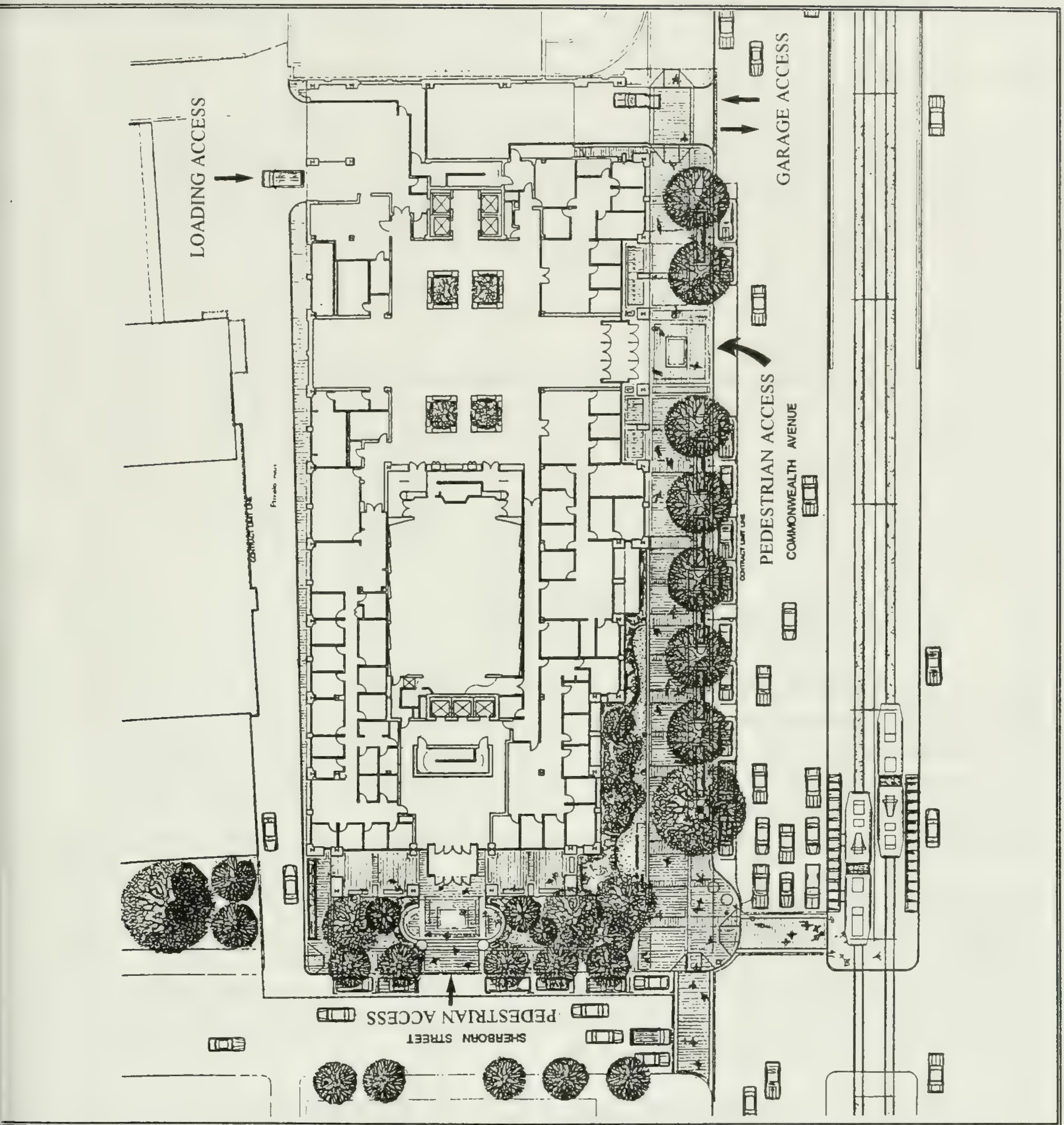
The Project provides subsurface parking for occupants and building users. The parking garage entrance and exit are located on Commonwealth Avenue east of the pedestrian entrance. Since traffic is only westbound along that divided portion of Commonwealth Avenue, vehicles parking at the building will only be allowed to enter and exit in the westbound direction.



Landscape Plan

Prepared By:
Cannon

Figure 2-19



Project Access

Prepared By:
Cannon

Figure 2-20

Service Access

The Project site is bounded by an alley on the north, which connects to Sherborn and Deerfield Streets. The building provides loading docks from the alley where trucks can park without blocking the alley. The loading docks are located off the alley in such a way that they will not impede alley circulation. Currently, the Boston University dormitory and other residential properties are served by this alley. Actual loading and deliveries will be through three loading bays, one of which is for a dumpster, in the rear of the building away from pedestrian areas. These will be accessed from the alley and segregated from other access points to the building. Service vehicles will be able to enter and exit the alley from either Deerfield or Sherborn Streets. Access points are shown in Figure 2-20. Because the Project predominantly contains classroom and related academic functions, it requires less supplies and generates fewer goods than typical of commercial buildings. Therefore, loading dock needs to adequately service this Project are less than might be required for other commercial buildings of a similar size. Furthermore, service and delivery activities for the Project can be coordinated with similar activities campus-wide allowing more flexibility in management of these activities than would typically be afforded with other buildings.

2.6 PROJECT BENEFITS TO COMMUNITY

The University already generates considerable revenues for the City of Boston and provides a multitude of services and benefits to Boston residents and employees. In 1992, the total economic impact of the University on the City was estimated to be $396.2 million. Over $2.8 million were generated in the form of fees, permits, taxes, and in-lieu-of-tax payments in 1992. The University provides municipal services in the form of street and MBTA stop maintenance, year-round police and security forces, public parking enforcement, and rubbish collection services.

Approximately 350 scholarships, worth $5 million, were awarded to Boston public high school graduates and teachers, City employees, graduates of local community colleges, and families of firefighters killed in the line of duty. The University directly and indirectly offers numerous educational, job training, health, legal, and cultural programs and services throughout the City. A more detailed description of the services and benefits Boston University provides the City is found in Section 1.9, Community Services and Benefits.

The Boston University new School of Management project will provide benefits to the neighborhood with improved street safety and urban design along Commonwealth Avenue. Economically, the current School of Management already provides many programs and services to businesses and residents of the City of Boston as described in Chapter 1.0, Project Summary. The new School of Management project will strengthen and improve the quality of these services and programs.

2.6.1 ECONOMIC

The Project will create approximately 300 construction jobs in the City of Boston over approximately a 28 month period. In accordance with Article 26B of the Boston Zoning Code, the Project will also generate approximately $221,700 for job training. Furthermore, the Project will generate over $1.1 million for the development of affordable housing in the City of Boston under Article 26A of the Boston Zoning Code. The Project will also provide new business for Kenmore Square businesses with the influx of students, employees, and visitors near the Square.

2.6.2 OTHER BENEFITS

The new School of Management project will improve the vitality of Commonwealth Avenue by filling an unsightly "gap" which currently exists along Commonwealth Avenue. The Project will create added green space and landscaping along Commonwealth Avenue and Sherborn Street and include new street furniture, sidewalk materials and other streetscape amenities. The University activities which will be located in this building are consistent with, and complementary to, business and academic activities which currently occur in the area.

Pedestrian safety will be improved through the Project by reducing from five to one the number of curbcuts along the block. Furthermore, the safety of pedestrian crossing movements will be improved through new crosswalks at Sherborn Street and Commonwealth Avenue, proposed neckdowns at the crosswalks and landscaping along the sidewalk which will discourage "jaywalking". The day and evening activities generated by the Project will also contribute to street safety.

2.7 PROJECT COSTS AND SCHEDULE

The cost to construct the new School of Management is estimated to be $75 million. Construction is scheduled to begin in the spring of 1994 and span a period of approximately 28 months. Completion of design review and any necessary zoning approvals is anticipated for fall of 1993 in order to achieve the construction schedule.

3.0 URBAN DESIGN

3.0 URBAN DESIGN

3.1 INTRODUCTION

This chapter provides a discussion of the new School of Management project in its urban context. Also included is a discussion of the Project's consistency with the Boston University Charles River Campus Master Plan 1986-1996 and University design trends. Both the nine and ten story building alternatives reflect the same design concepts, although the reduced alternative creates a less pronounced visual impact.

3.2 MASTER PLAN

3.2.1 BACKGROUND

In 1980, Boston University entered into a Cooperation Agreement with the City of Boston which articulated the University's desire to consolidate the academic core of the Charles River Campus. The Agreement established a development plan and tax program for the campus area and defined a growth corridor for the campus. Following a series of discussions between the City and the University during 1984 and 1985, the University embarked on the preparation of a "Master Plan" which addressed housing, parking, academic facility, and athletic program needs based on student enrollment projections through 1995. This document was developed through a comprehensive process which involved the BRA and other City officials; University representatives; and the Boston University Task Force including community groups from Boston, Allston, Brighton, and Brookline. A major feature of this plan, published in February 1987 with the endorsement of the Task Force, was the identification of sites within the Charles River Campus which could accommodate identified needs of the University. The Master Plan is not an inflexible tool or rigid program for the future; it is an advisory document which offers the University's vision and anticipated long-term needs while responding to neighborhood concerns and to City policies and goals for the area. It is a document which reflects a sharing of ideas and general consensus about what could happen between 1986-1996. At this time, it is anticipated that the Master Plan will be updated and renewed in 1996.

Objectives of the Master Plan

The relevant objectives of the Master Plan include the following:

- to create a unified campus with delineated areas for housing, academic and administrative uses;

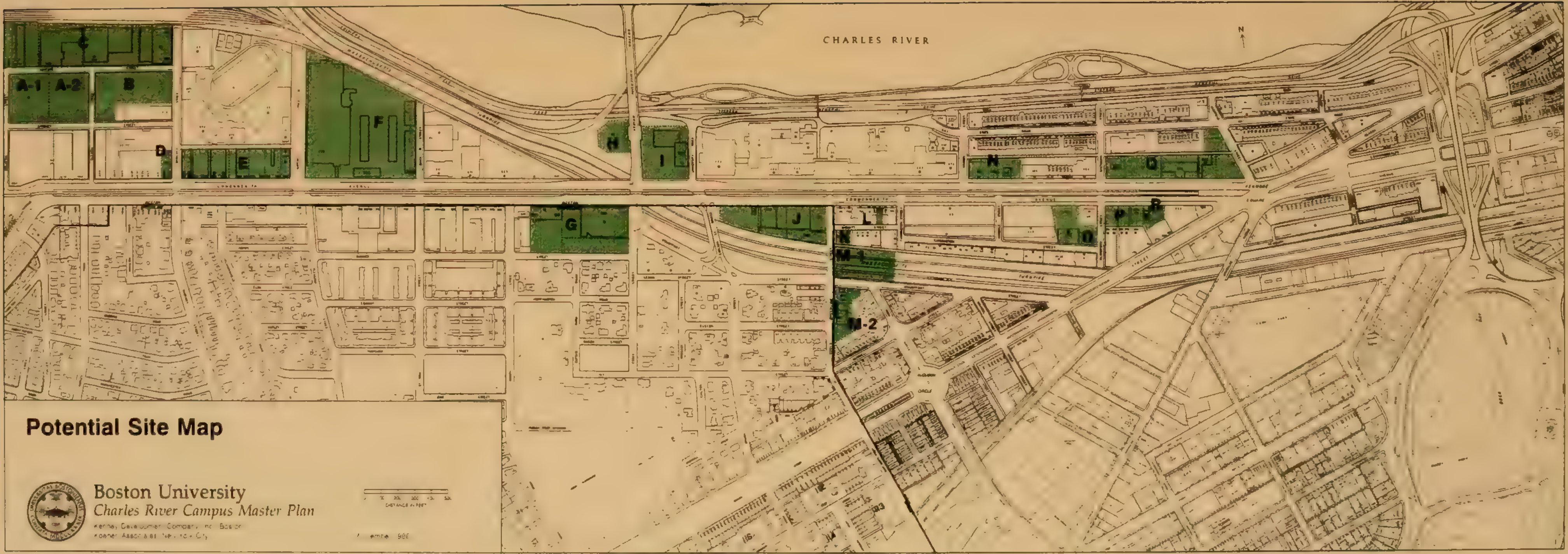
- to reinforce the academic core of the campus by developing supportive academic and administrative uses at key central campus locations;
- to consolidate uses located in various locations throughout campus into single locations and thereby maximize campus space and minimize the need to spread into other areas; and
- to recognize the impact of new development near the campus edge with a view to minimizing adverse impacts on adjacent uses.

Among the major potential sites identified for future acquisition and development by the University was the block along the north side of Commonwealth Avenue bounded by Sherborn Street on the west and Kenmore Square on the east, and which extends along Deerfield Street to Bay State Road on the north. At the time of the Master Plan, the five properties comprising this tract, including two parcels owned by the University, two owned by Robert Sage, Inc., and one by Texaco, Inc., were designated as Parcel Q in the Master Plan (see Potential Site Map on the following page). Since the issuance of the Master Plan, the University has completed the assemblage of the entire tract, acquiring the gasoline service station from Texaco (removed and paved for parking) and, most recently, the Howard Johnson's Motor Lodge and associated surface parking lot on Deerfield Street.

The Master Plan proposed that Parcel Q be developed by the University for a mix of academic, commercial, and residential uses. Specifically, the plan recommended the consolidation of the School of Management (currently dispersed among several buildings throughout the campus) and development of a conference center at the site. For commercial development, the plan contemplated several ideas including expansion of the existing hotel facilities (to support the conference center) and a mix of private office, retail, residential uses, and open space.

The Master Plan noted that Parcel Q is an important site, not only in terms of its role for the University in accommodating future growth, but also because of its adjacency to Kenmore Square. The site has the potential to have a positive impact on the Square by serving as a transition between the commercial uses which characterize Kenmore Square and the academic environment of the University Campus. It is appropriate, therefore, that the Master Plan did not specify height, density or massing, but recommended that Parcel Q be designated a Planned Development Area (PDA) by the Boston Redevelopment Authority (BRA). This designation would afford the City the opportunity to fashion development guidelines unique to this property which respond to the specific needs of the University while respecting the community's concerns about the relationship of University expansion on this site to Kenmore Square and Bay State Road.

The assembly of Parcel Q has only recently been completed. The existing Howard Johnson's Motor Lodge has a long term lease and is anticipated to remain operating on the Parcel. Beyond this, there are no additional feasibility analyses or plans which further define the development of Parcel Q or indicate development which differs from the goals stated in the Master Plan. The



Potential Site Map

Boston University
Charles River Campus Master Plan
Kenney Development Company, Inc. Boston
Koener Associates, New York City

[illegible] 1986

Master Plan recommends commercial development on Parcel Q. With the economy remaining uncertain, it is not possible to further define what that development will be for the remainder of Parcel Q. The BRA will be involved at the earliest possible time when the University is prepared to move forward. If possible, Parcel Q development will be further defined in the 1996 Master Plan.

3.2.2 MASTER PLAN CONSISTENCY

During the Master Plan development process, it was recognized by all parties that the existing zoning classification was inadequate outdated and would not accommodate academic activities or the mix of uses and density of development approved in the document. As a portion of Parcel Q, it is appropriate that the Project site go through the PDA process. The BRA Board has reviewed the Project PDA plan and found the new School of Management project consistent with the Master Plan and the general plan for the City of Boston. The BRA voted approval of the Project on June 24, 1993, and the Boston Zoning Commission approved the PDA on August 18, 1993. A copy of the BRA vote is found in Appendix F. Consistency with the Master Plan and Cooperation Agreement is also supported in the Boston University Task Force vote of approval of the Project, in addition to the BRA Board and Zoning Commission approvals mentioned above.

The University's approach to the development of Parcel Q and the new School of Management project has remained consistent with the 1987 Master Plan and the Cooperation Agreement. The Project designates academic uses which are appropriate and consistent with concerns and goals expressed in the Master Plan and responsive to concerns of the community. In order to remain consistent with these goals, the University needs to maximize the use of its available development sites. The Project exemplifies this by including several uses into one building by, "piggybacking" administrative space with the new School of Management, and including expensive underground parking on the Project site.

The University has proceeded with consolidation of the ownership of Parcel Q, but has not developed plans for the remainder of Parcel Q beyond what is already stated in the Master Plan. At this time, the University has specified plans only for that portion of Parcel Q that is being proposed for the new School of Management site, representing approximately 35% of the total Parcel. There are available resources to proceed with the consolidation and upgrading the School of Management and centralization of certain executive administrative activities. The Project site, then, presents an immediate opportunity which allows the University to address urgent needs to upgrade academic facilities in an optimum location -- walking distance to most of the campus -- while remaining consistent with the Master Plan. When development concepts can be defined for the remainder of Parcel Q, the University will work closely with City of Boston to do so. In the meantime, existing uses will remain in place on the balance of the Parcel and concepts stated in the Master Plan for Parcel Q -- academic, commercial office, retail, residential, expanded hotel and conference, and open space -- remain appropriate guidelines.

Although other sites were considered for short-term upgrading and consolidation of executive administrative space, Parcel Q is considered most suitable and timely. The need to upgrade and consolidate administrative space on campus has also become acute. Although the Project offers a step toward addressing these needs, only a portion of administrative space is accommodated by the Project. For example, the Master Plan designated Parcel I (University Road and Commonwealth Avenue) for continued parking, recreation, and student activities in the short term. Long-term uses contemplated for the site include office space to be implemented for student services (academic, student placement, and career counseling) and administrative space after the Boston University Armory is built allowing the relocation of parking and recreation activities. The site is also contemplated for classroom facilities with specialized media equipment, student and community counseling, or expanded library facilities to relieve overcrowding in the main library. Development of Parcel I for these uses is still being contemplated. It is particularly suitable for administrative functions oriented toward student activities. The new School of Management project includes consolidation of some executive administration which is a small portion of campus administrative activities.

The Master Plan did not discuss specific program allotments for potential development sites. It did, however, mention that the new School of Management was estimated to be 120,000 square feet. Today, the School of Management occupies approximately 90,000 assignable square feet[1] (approximately 126,000 gross square feet). Therefore, the 120,000 square feet suggested in the Master Plan represent an expected increase of 30,000 assignable square feet. The new School of Management, housed in floors one through six of the Project, contains approximately 126,000 assignable square feet (approximately 221,400 gross square feet). The Project proposes a modest 6,000 square foot increase in assignable space over the original 1986 estimate.

Compared to some of the existing administrative facilities on campus, the new Project will provide greatly improved quarters capable of accommodating the computer systems and other equipment common to the modern office. Thus, the Project generally reflects an upgrade of facilities on campus, rather than an expansion of those facilities. A more detailed discussion of new and vacated space utilization may be found in the sections following.

3.2.3 VACATED AND NEW SPACE ON CAMPUS

For most of this document, the Project is described in gross square feet. Academic space in most higher education facilities, however, is described in terms of assignable square feet. In this section, "assignable square feet" is nomenclature employed to provide a consistent and useful method of discussing space utilization on campus and is roughly comparable to "net rentable square feet" in the real estate industry. Assignable square feet represents space which is actually used by a function or department and excludes common areas, maintenance areas, and mechanical space.

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[1] Assignable square feet is defined in the "Revised Higher Education Facilities Inventory and Classification Manual", March 1991, published by the National Center for Education Statistics. It reflects all areas specifically assigned. For example, classrooms, offices, administrative and program space, library, auditorium, canteen/kitchen, meeting rooms would be assignable. Common areas such as halls, stairwells, maintenance, mechanical and structural space would not be assignable.

Section 3.2.4 provides a description of the how space which is vacated as a result of the Project will be reused for the upgrade of existing programs and for new research programs.

Vacated and New School of Management Space

The Boston University School of Management currently occupies approximately 90,000 assignable square feet. The new School of Management will occupy approximately 126,000 assignable square feet. As described in previous chapters, this reflects state-of-the-art classrooms, case study rooms, break-out rooms, computer facilities, a new lecture hall, new library, executive education center, canteen and supporting kitchen facilities, and upgraded faculty and supporting administrative offices. Management school teaching techniques have changed radically since the current facilities were constructed 60 years ago. Contemporary teaching techniques and curriculum require large floor to ceiling heights to accommodate case study rooms and new expanded library, lecture hall, and computer facilities.

The new School of Management design includes a new executive education center in addition to upgrading academic and office space standards. This accounts for the addition of approximately 6,000 assignable square feet over the original 120,000 square foot estimate in the Master Plan. The Project does not reflect a significant increase in the enrollment at the School of Management. Additional discussion of School of Management program needs and techniques is found in Chapter 1.0, Project Summary and Chapter 2.0, Project Description. The vacated and new space associated with the School of Management component of the Project remains the same for both the nine and ten story alternatives.

Vacated and New Executive Administrative Space

The executive administrative space located in the nine story project alternative will occupy approximately 36,000 assignable square feet. The Project is estimated to provide approximately 59,000 assignable square feet. This reflects upgraded office space and includes a new Board of Trustees meeting facility. Under the ten story alternative, occupants of approximately 59,000 assignable square feet would have been relocated into approximately 80,000 assignable square feet in the Project. The nine story project reduces the amount of existing administrative space to be vacated by approximately 23,000 assignable square feet and reduces new executive administrative space by approximately 21,000 assignable square feet. A summary of the comparison is found in Tables 3-1 and 3-2.

Table 3-1 *New Assignable Square Feet*			
	Nine Story Building	**Ten Story Building**	**Reduction**
School of Management	126,000	126,000	0
Administration	59,000	80,000	21,000

Table 3-2 *Vacated Assignable Square Feet*			
	Nine Story Building	**Ten Story Building**	**Reduction**
School of Management	90,000	90,000	0
Administration	36,000	59,000	23,000

3.2.4 REUSE OF VACATED SPACE

The space vacated by the School of Management project will be utilized in a variety of ways including upgrading and expanding the existing uses and special programs identified below. Table 3-3 provides a summary of vacated space and anticipated reuse programming.

School of Management Space

The existing School of Management is currently spread out in six locations along Commonwealth Avenue. The spaces to be vacated range in size from approximately 300 to 44,000 assignable square feet. This space includes approximately 18 classrooms, and over 125 faculty and support offices. The vacated classroom space will be reallocated for ten general use classrooms. The existing School of Management library space will be used for expanded shelf space of the main library. Some of the office space will remain and be upgraded for other faculty. In accordance with the Master Plan, the building at 704 Commonwealth Avenue, which contains approximately 17,000 assignable square feet, is slated for a feasibility study for re-use as dormitory space.

It is anticipated that approximately 28,000 assignable square feet of vacated space currently part of the School of Management will accommodate new laboratory and other programs which could generate up to 28 new jobs on campus. Other academic departments are planned to relocate into a portion of the vacated space from the School of Management. The second generation space vacated by these two programs, approximately 21,000 assignable square feet, will be used for reallocation and upgrading of student program space and expansion of the Science Library. These are not new uses and are not anticipated to generate new jobs. The reuse of School of Management space remains the same for both the nine and ten story alternatives.

Executive Administrative Space

As shown in Table 3-3, approximately 36,000 assignable square feet of administrative space will be vacated as a result of the Project. This space is currently distributed among six locations on Bay Sate Road, Commonwealth Avenue, and Buick Street. These spaces range in size from approximately 1,000 assignable square feet to 12,000 assignable square feet. It is anticipated that in three of these locations, either existing or new special programs will be assigned. These will be located largely in the desirable offices along Bay State Road. Special programs tend to be small research centers or institutes which focus on very narrow fields. They typically contain offices for limited numbers of full-time faculty, one or two visiting faculty, space for graduate work, and small seminar rooms. Examples of existing special programs on Bay State Road include the Center for Educational Development in Health and Center for Defense Journalism. It is estimated that if the vacated space in these three locations is filled with new programs, up to 60 new jobs could be created when these spaces are vacated.

The majority of vacated administrative space will be used to upgrade and expand the accommodations of the existing administrative occupants. A portion of the space will be used to relocate student services offices. The second generation of space vacated as a result of the project administrative space is comprised of approximately 7,000 assignable square feet. This space is currently unassigned but is anticipated to be available for added offices which could potentially generate up to 25 new jobs on campus.

The ten story alternative would have vacated approximately 23,000 assignable square feet more than the nine story project. This would have been used for further upgrading of existing offices and would have allowed an upgrade of other program offices which was estimated to generate six new jobs.

Table 3-3
Summary of Anticipated Space Reuse for Nine Story Alternative

LOCATION	***SQUARE FEET (ROUNDED)***	***PROPOSED USE***	***NEW EMPLOYMENT POTENTIAL***
SCHOOL OF MANAGEMENT	***(School)***		
685 Commonwealth Ave.	44,000	General Class/Office/Lab Relocate Academic Department (1)	8 0
621 Commonwealth Ave.	13,000	Relocate administrative offices New programs (2)	20
704 Commonwealth Ave.	17,000	Study reuse as dormitory	0
771 Commonwealth Ave.	15,000	Expand library shelf space	0
730 Commonwealth Ave.	300	Upgrade existing uses	0
985 Commonwealth Ave.	700	Upgrade existing uses	0
Total for School	***90,000***		***28***
ADMINISTRATION			
147 Bay State Road	8,000	Special Program	25
145 Bay State Road	7,000	Special Program	20
59 Bay State Road	1,000	Upgrade existing uses	0
881 Commonwealth Ave./ 25 Buick St.	12,000	Upgrade existing uses Relocation of administrative offices (3)	0 0
10 Lenox St./25 Buick St./143 Bay State Road	8,000	Upgrade existing uses Special Program	0 15
Total Administration	***36,000***		***60***
Second Generation Moves			
(1) 111 Cummington St.	19,000	Science Library	0
(2) 775 Commonwealth Ave.	2,000	Expand student program space	0
(3) 985 Commonwealth Ave.	7,000	Unassigned	25
Total Second Generation	***28,000***		***25***
GRAND TOTAL	***154,000***		***113***

3.3 URBAN FABRIC

Considerable attention in the design of the new School of Management project has been given to the unique urban context surrounding the new building. In particular, the design responds to the following:

- the "landmark" location of the building and the building's relationship to Kenmore Square;
- the concept of an urban campus including the nature of Commonwealth Avenue; and,
- the large number of people using the building.

These influences are not distinct, but overlapping; a response to one may also affect to another. It is important to consider the Project in the context of transition along Sherborn Street from Bay State Road to Commonwealth Avenue, as well as from commercial Kenmore Square to the academic campus along Commonwealth Avenue.

The before and after views of the Project, Figures 3-1 through 3-5, and Figures 12-3 through 12-7 in Chapter 12.0, Historical and Archaeological Resources, were selected in an attempt to better understand the potential visual impacts from the new School of Management project in relationship to its surroundings. These views were developed by taking recent photographs of existing conditions which best present the relationship of the Project to its surroundings. Computer images of the Project, and existing adjacent buildings were then created. Perspective views matching the photographs were then printed out from the computer. Next, these printouts were enlarged until the computer-generated outlines of existing buildings matched the photographic images of the existing buildings. Once this match was achieved, the combined images were presented in sketch form.

In its June 24, 1993, memorandum, the BRA recommends that the Project "...is critically important to the sensible growth of the Kenmore Square area. The urban elements of the Proposed Project reflect the needs of Kenmore Square, while respecting the public goals and guidelines established for development in Boston..." The memo further states "...By turning an underutilized site into a School of Management and administration center, the Project will convert the site into a physical and financial asset and will improve land values and provide economic stimulus. By using materials and designs which are harmonious with the surrounding neighborhood, the Project will strengthen the neighborhood without compromising the historic and architectural integrity of the area..."

Kenmore Square

With a diverse array of entertainment opportunities, stores and eateries, Kenmore Square is one of the prime social magnets in the City of Boston. Locating the School of Management and executive administrative offices at this location along Commonwealth Avenue will increase the concentration of people and activity at this entrance to the University. This will reinforce the use of the commercial establishments of Kenmore Square and also take advantage of the existing MBTA bus and fixed rail system, so as to reduce the number of car trips generated by the facility. Furthermore, the existing parking lot creates an unwelcome gap in the rhythm of buildings along Commonwealth Avenue and a potential safety problem in the area. The Project will fill the hole and offer a friendly pedestrian transition onto campus.

At the same time, the building is sufficiently distanced from Kenmore Square (500 feet from the intersection of Commonwealth Avenue and Deerfield Street to the nearest boundary of the Project site) that it is appropriately exclusively academic in use. Through the stepped alignment of its facade, the new School of Management building facilitates a smooth transition between the commercial buildings to the west of the site, which are set close to the sidewalk toward Kenmore Square, and the academic campus buildings set farther back from the sidewalk. As discussed in the Master Plan section above, the balance of this block (Parcel Q) can be programmed for mixed academic and commercial uses in the future which are compatible with Kenmore Square and the Project.

Campus Gateway

The new School of Management will be the first academic building encountered by a person traveling west from Kenmore Square along Commonwealth Avenue onto the University campus, whether the person is in a car, using the MBTA, or is a pedestrian. On the south side of Commonwealth Avenue, the Metcalf Center and Morse Auditorium have served for the last ten years as the "entrance" to the campus from the east. The new School of Management will complete this "entrance" on the north side of the street. This function is achieved both at the pedestrian level and on a larger scale.

For a westbound passenger on the MBTA, the Project will be the first building seen as one emerges above ground from the tunnel. As such, the building forms a gateway to the campus on a pedestrian level. The building, located on the north side of Commonwealth Avenue, will do what Morse Auditorium does on the South side -- change one's perception of the environment from commercial to academic.

On a larger scale, the building must also perform the same function when viewed from Kenmore Square -- indicate the beginning of an academic campus distinct from the commercial environment of the Square. Thus, a distant viewer will see where Boston University begins, indicating the transition from commercial facilities to academic. The building must be perceived, even at a considerable distance, to be part of the Campus. This goal has been accomplished with the current building design.

Currently, the view east along Commonwealth Avenue at Granby Street includes the Howard Johnson's Motor Lodge, the Citgo sign and, in the distance, Prudential Center. These eastward views on the north side of Commonwealth Avenue need a benchmark showing the terminus of the linear campus as discussed below. The new building will achieve this function.

Linear Campus

As a result of the growth pattern of the University, Commonwealth Avenue is emerging as the campus spine, both literally and perceptually. Along its broad sidewalks, students go to the classroom buildings, converse, congregate and socialize. Most people recognize Commonwealth Avenue as the University's unifying feature, while Kenmore Square, the Charles River, and B.U. Bridge as defining features on campus. The new School of Management serves to further focus attention on this linear identity.

For the length of the campus, Commonwealth Avenue is essentially two one-way streets, divided by the MBTA tracks. The MBTA service on Commonwealth Avenue further reinforces this linear spine. Where Commonwealth Avenue is cohered in the Back Bay area by a congruity of materials, details, ages, and building heights, this portion of the Avenue has none of these unifying features. Buildings in this area are of all heights and setbacks and could be best be described as corrugated. Building styles, materials, and detailing are in direct contrast from one side of the street to the other. The lack of unification is further aggravated by the MBTA tracks slicing down the middle of the street. The final barrier is the iron piling fence separating the tracks. It not only prevents people from crossing back and forth between the two sides, but also draws a visual boundary. Looking up and down the street, one does not have the feeling of a space with walls, but of a series of disjointed objects.

The development of the Project site will reinforce this linear quality in a positive way. Through the building footprint, the location of the building on the site, and the landscaping, the perception of "campus" will be reinforced. As pointed out in the discussion of the campus gateway, the building's height and use strengthen this concept.

Building and Site Edges

Along Commonwealth Avenue the new School of Management building meets the ground in a series of vertical planes that gradually narrow the width of space from the building to the street from 45 feet to 25 feet. This reinforces several goals consistent with the building forming an end to the campus and the gateway to the City: the narrowing forms a transition from the "campus" sidewalk width to the commercial sidewalk width, and for the observer looking eastward, these planes protrude into the view, bringing the desired visual closure which is currently lacking.

The southwest corner of the new building will align with two reference planes. They are the south facade of the building across Sherborn Street and the west facade of the Boston University dormitory on the other side of the alley. Along Sherborn Street, the Boston University dormitory and the new building will present a uniform edge to the sidewalk. Along Commonwealth Avenue, the new building will align with the academic School of Education building on the west side then, moving east, step out to align with the Howard Johnson's Motor Lodge creating a transition between the campus and commercial buildings. For these two site edges, then, the new building will form the backdrop to the landscaping, which also plays a role in defining the campus.

The Project building mass is segmented along Commonwealth Avenue in such a way as to allow alignment with all surrounding buildings. The main part of the west facade aligns with the Boston University dormitory and across Bay State Road to preserve site lines to the River, the southwest corner of the building aligns with existing buildings located on Commonwealth Avenue westward, and the southeast corner of the building aligns with the facade of the existing Howard Johnson's Motor Lodge. This articulation makes a transition from the academic character of Charles River Campus to the commercial character of Kenmore Square.

Sherborn Street acts as the transition between the visual diversity of Commonwealth Avenue and the homogeneity of Bay State Road. On the east side of the street, a Boston University dormitory forms the corner of Sherborn Street and Bay State Road. It serves as a transition in height and style to the fabric of Bay State Road. At grade level, the School of Management will align with the face of the dormitories and carry through the wide planting strip between sidewalk and building edge. Thus, the perceptual width of Sherborn Street is doubled, creating a boulevard leading to Bay State Road.

At approximately 150 feet to the top parapet, the new School of Management is in scale with other buildings on Commonwealth Avenue, but taller than buildings along Bay State Road. Looking west down the street, the long views show that the sides of the Project will be blocked by trees and the cornice line of the row houses. It is only when one approaches the new building that its presence will be felt, first at the grass yard to the east of the dormitories and then again from in front of the dormitories. In both these situations the new building will have a positive effect.

When viewed from the street, the grass yard creates a gap in the rhythm of row houses. The pine trees and fence at the rear lot line shield a pedestrian from seeing the alley. The new building will alter this by forming a backdrop and end to the yard. With three sides enclosed instead of two, the wall space becomes a variation in setback instead of a hole in the "wall" of the street; it becomes more of a park fronting on the street. Before and after views along Bay State Road are found in Chapter 12.0, Historic and Archaeological Impacts.

Height and Massing

The Project building will be viewed prominently along Commonwealth Avenue. It will replace Howard Johnson's Motor Lodge and the Burger King sign as the identifying landmarks at the eastern end of the Campus. From a distance, the most significant identifying landmark of

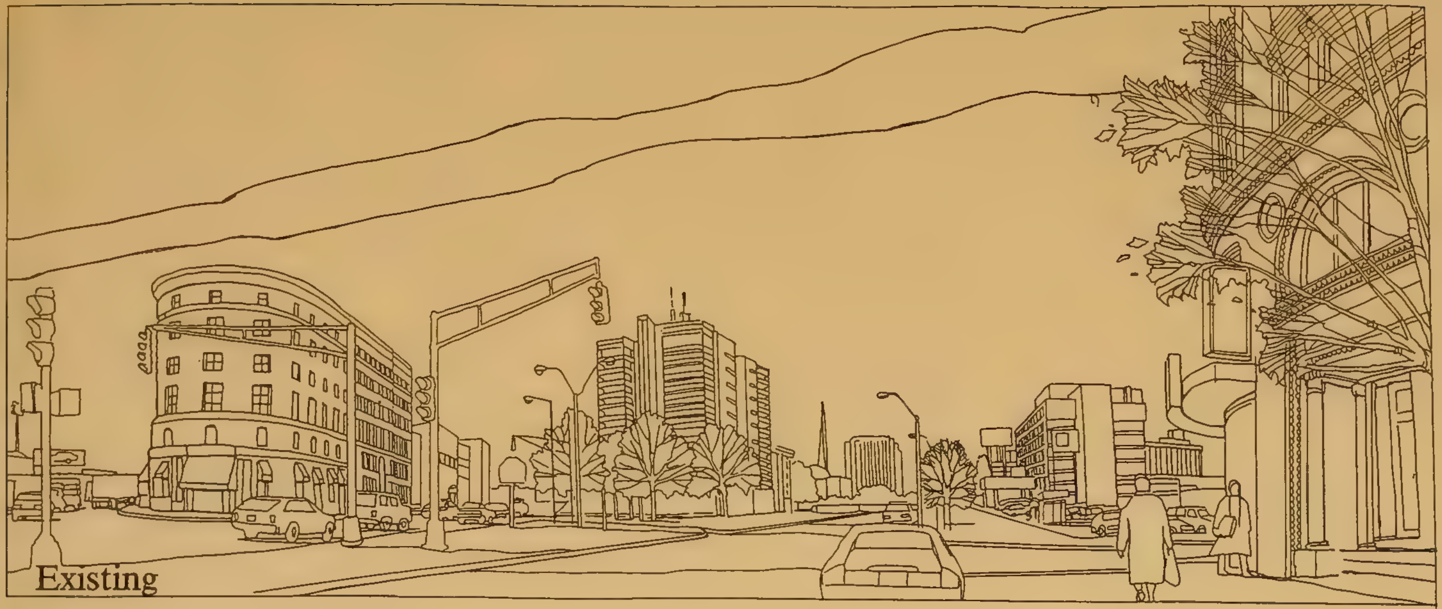
Kenmore Square, the Citgo sign, will still be unchallenged. The nine story project presents a significant reduction in scale from the original ten story alternative. The height is reduced by deleting one floor of administrative space, reducing the height of the mechanical penthouse, and by reducing floor to ceiling heights. The result is a height reduction totaling over 18 feet. In addition to a reduction in height, the massing and bulk of the building are also significantly reduced. The fifth floor parapet of the nine story building now lines up with the Howard Johnson's Motor Lodge and the Boston University Bookstore Mall. The reduced height and massing configuration is shown in Figure 3-6.

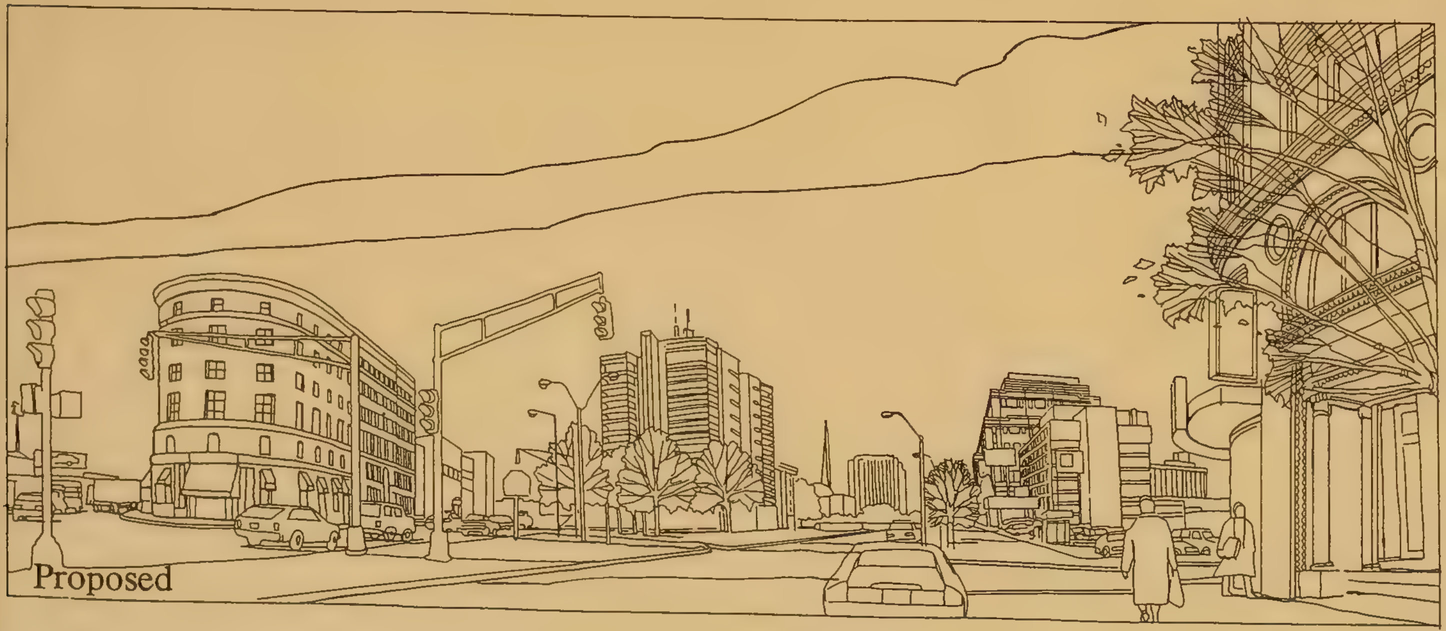
The new School of Management building, while prominent, will not be overbearing or out of context. When viewed in relation to other representative buildings near the Project site, it can be seen how it fits into the commercial and campus area. The buildings selected for comparison purposes range in height from a Bay State Road townhouse at approximately 42 feet in height to the nearby Boston University Law School at over 232 feet in height. In between this range is the Boston University dormitory on Bay State Road at approximately 79 feet, 566 Commonwealth Avenue (Kenmore Tower) at approximately 123 feet, and 700 Commonwealth Avenue (Warren Towers) at 176 feet, the new School of Management project fits within the range of buildings as illustrated in Figure 3-7.

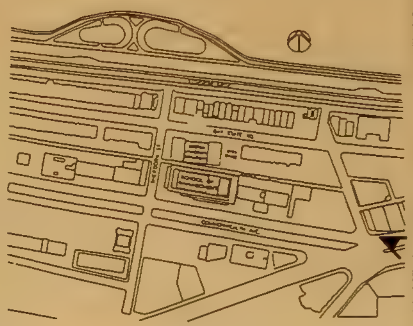
From the southern bank of the Charles River, the view of the new School of Management project is largely obscured by existing buildings. Only the upper portion of the building is visible from the southern bank of the River. These upper floors are outfitted with curved balconies which mimic the rounded townhouses also seen from this vantage point. (Additional building facade detail is discussed below). A typical view of the building as seen from this area of the riverbank near the Project is shown on Figure 3-8.

Facade Treatment

Over the last 10 years, the architectural signature of new buildings on the Charles River Campus has been consistent. This style employs a red brick middle with a light colored stone base and large deep recessed windows with brick lintels overhead, similar in style to the Boston University Bookstore Mall. The use of red brick with a stone base pattern is also consistent with the style of historic buildings in the area such as Myles Standish Hall dormitory and 147 Bay State Road. The presence similar styles can be seen beginning in Kenmore Square at the Boston University Bookstore, continuing west on Commonwealth Avenue at the Metcalf Science Center (590 Commonwealth Avenue), the Biology and Physics Building (620 Commonwealth Avenue), and Sargent College (630 Commonwealth Avenue). The new School







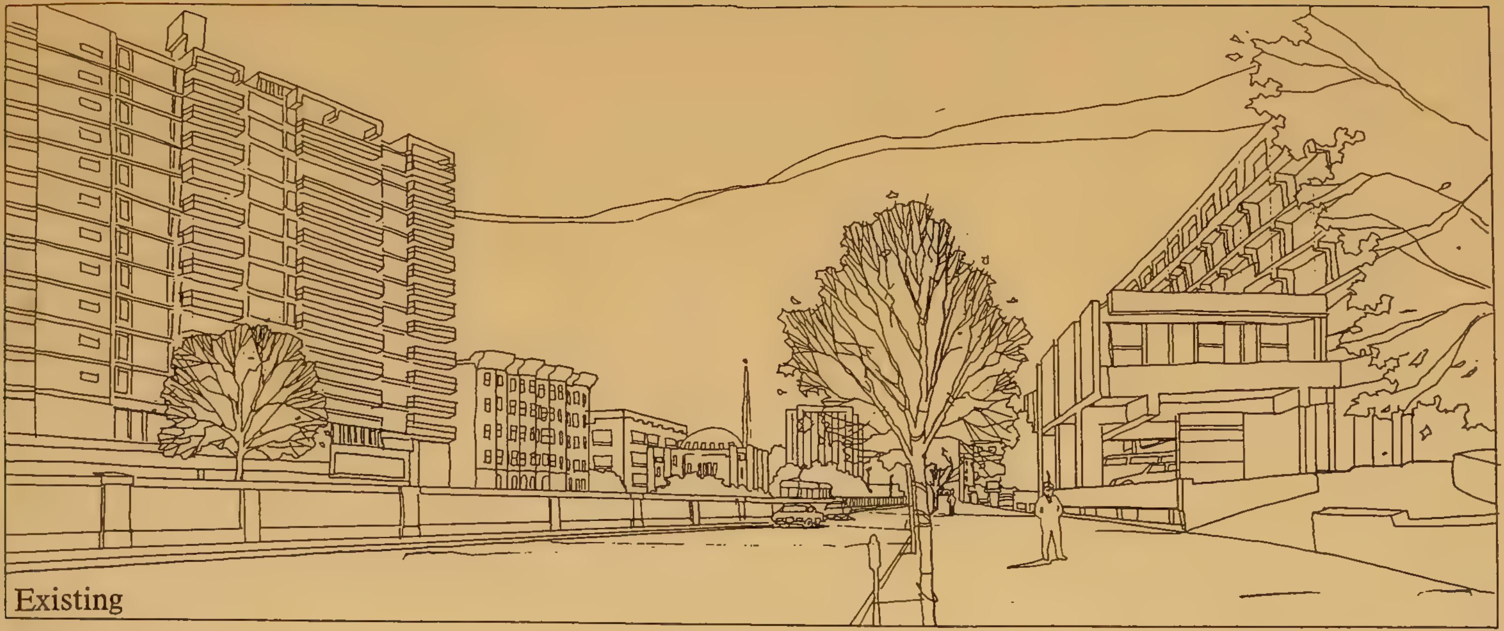
**BOSTON UNIVERSITY
SCHOOL OF MANAGEMENT**

***View on Commonwealth Ave.
at Kenmore Square
Looking West***

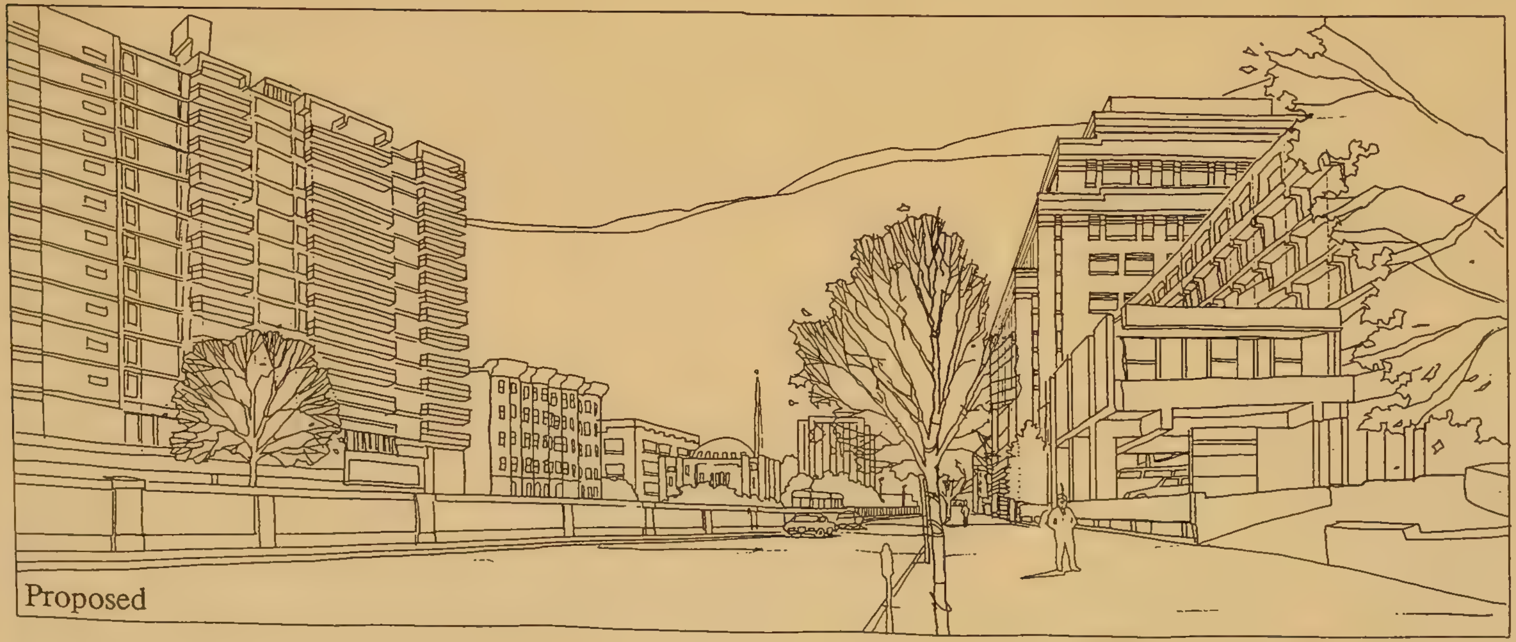
Figure 3-1

Prepared By:
Pressley Associates, Inc.

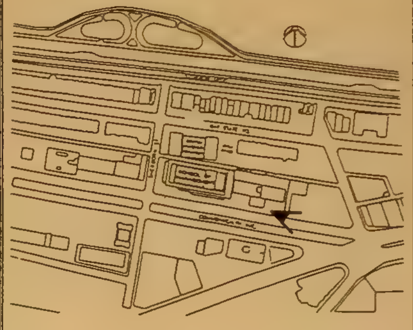
July 1993



Existing



Proposed



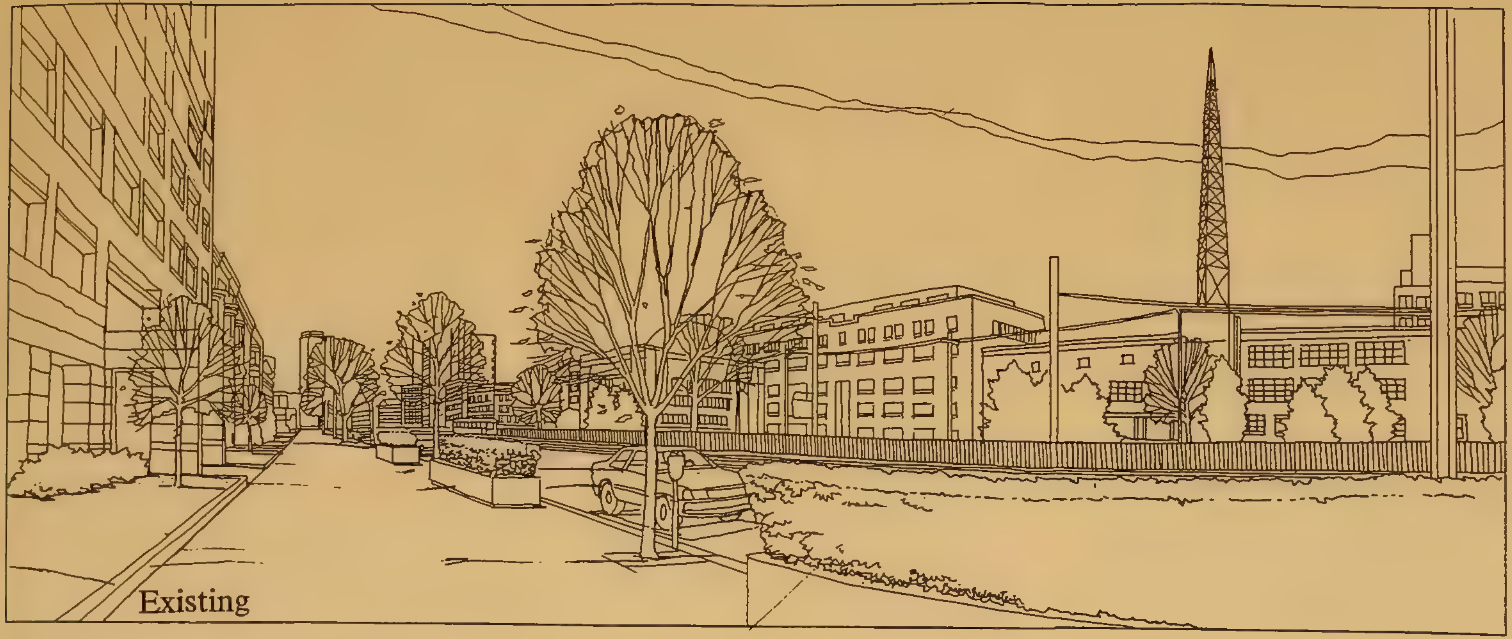
BOSTON UNIVERSITY SCHOOL OF MANAGEMENT

View on Commonwealth Ave. from Howard Johnson's Looking West

Figure 3-2

Prepared By:
Pressley Associates, Inc.

July 1993



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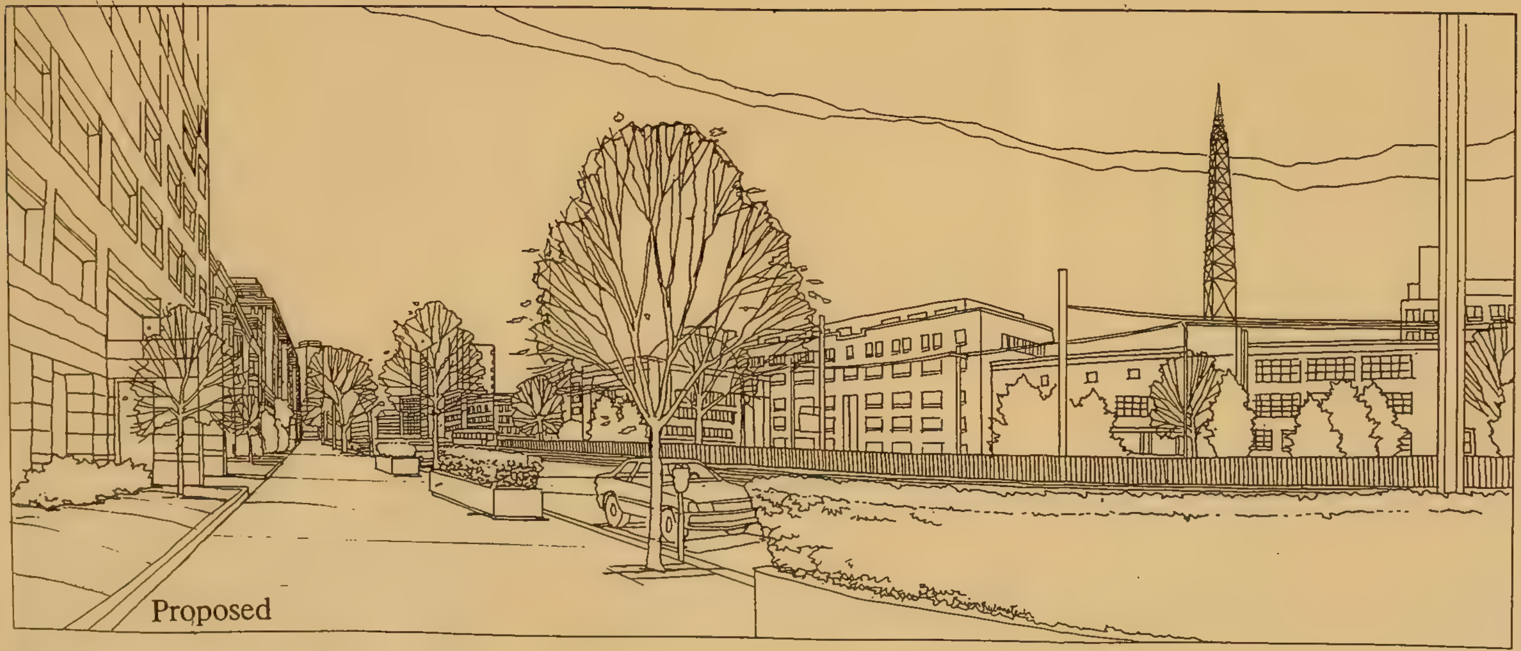

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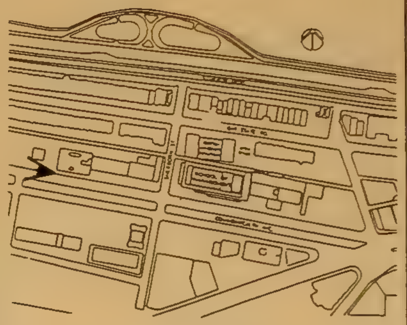


BOSTON UNIVERSITY SCHOOL OF MANAGEMENT

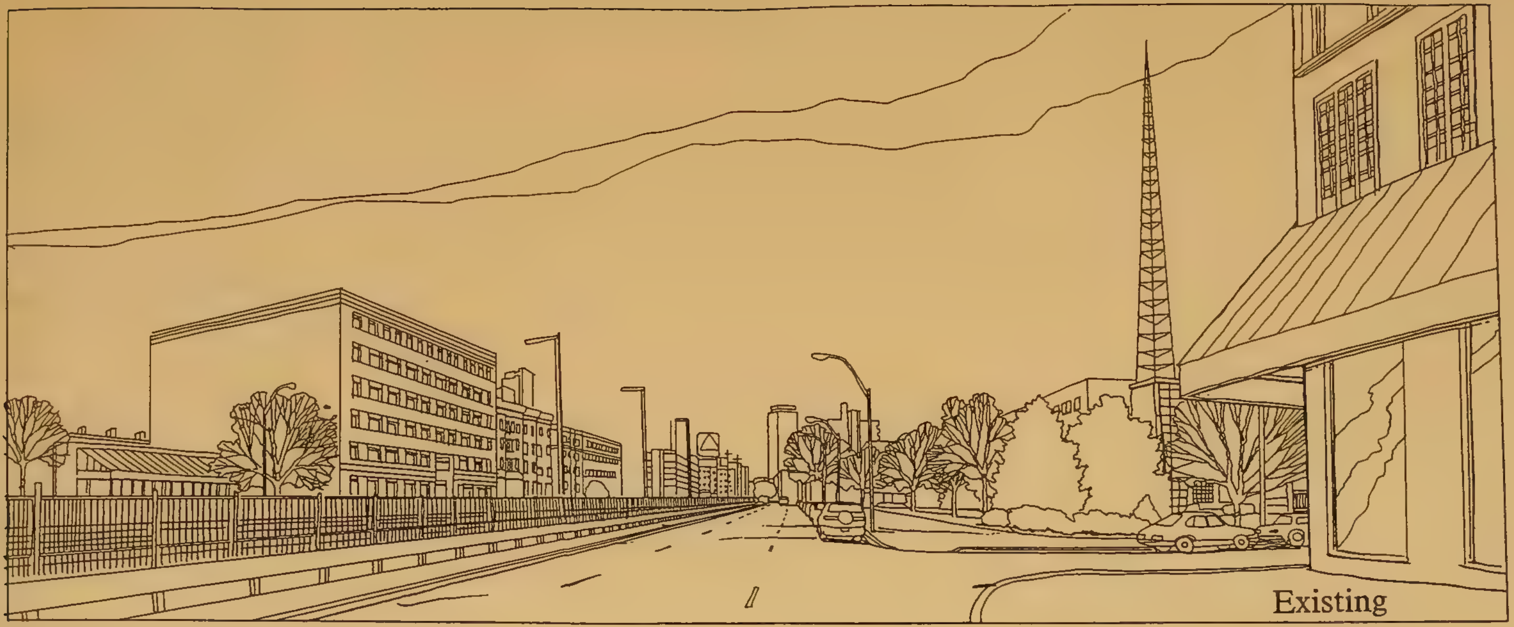
View from Commonwealth Ave.
(North side)
Looking East

Figure 3-3

Prepared By:
Pressley Associates Inc.

Pressley Associates, Inc.

July 1993



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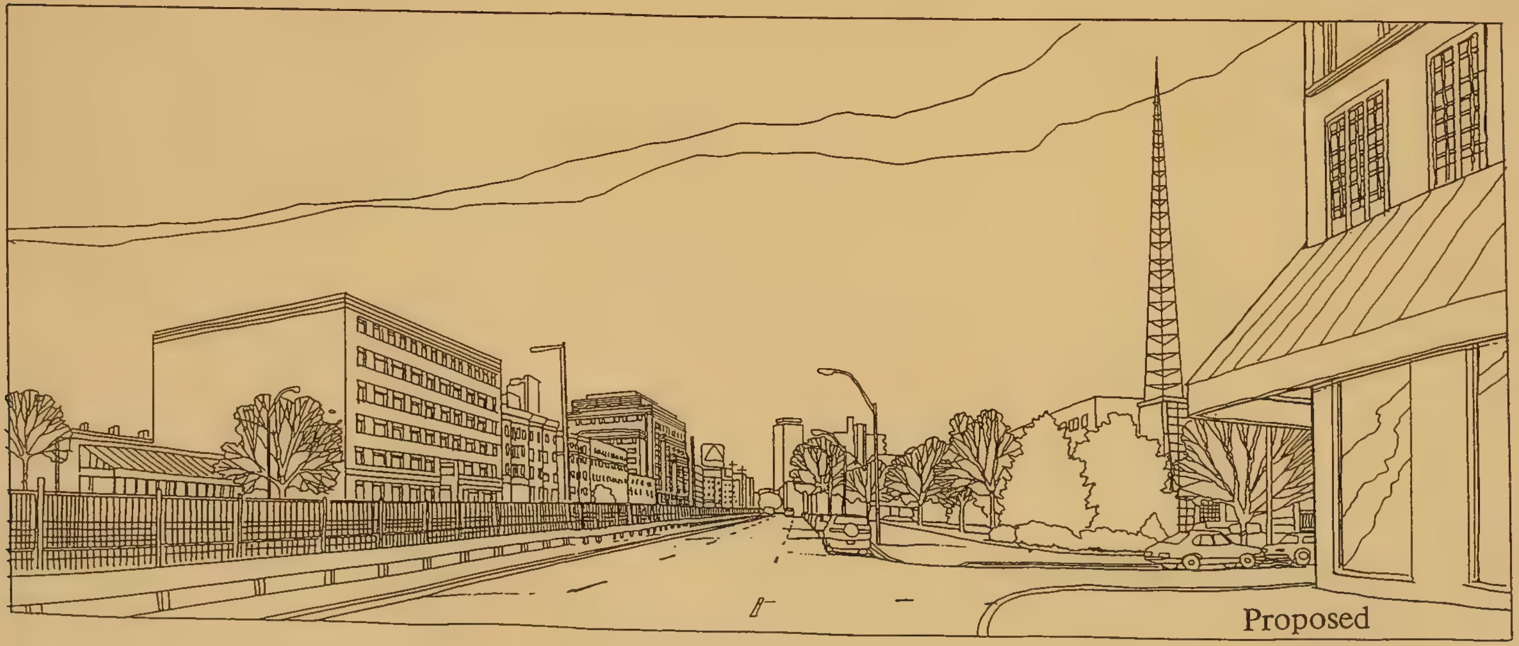

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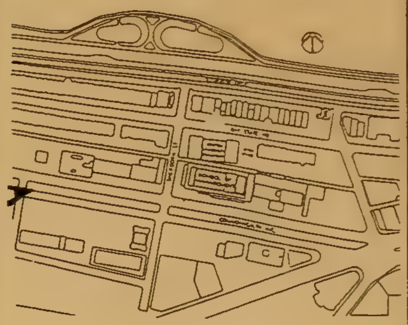


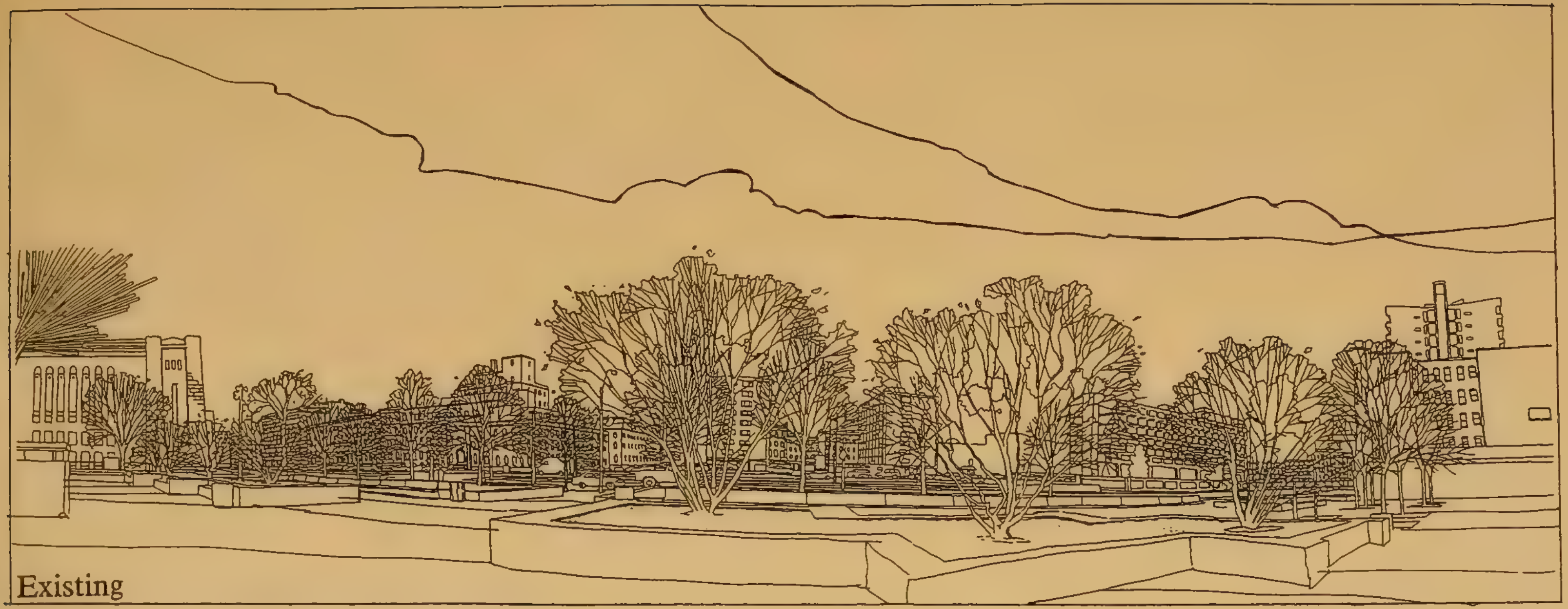
BOSTON UNIVERSITY SCHOOL OF MANAGEMENT

View from Commonwealth Ave.
(South side)
Looking East

Figure 3-4

Prepared By:
Pressley Associates, Inc.

July 1993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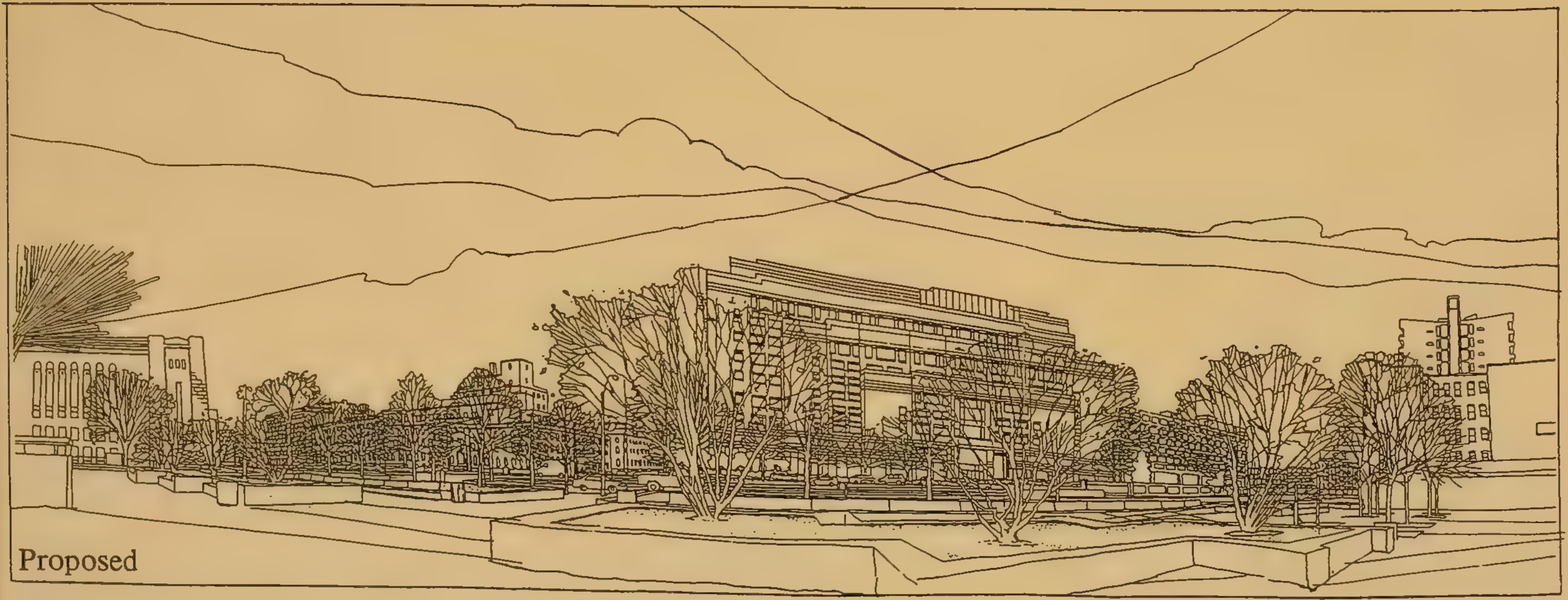
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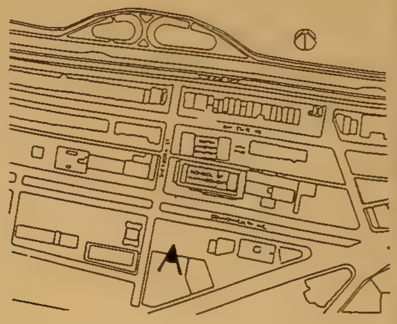


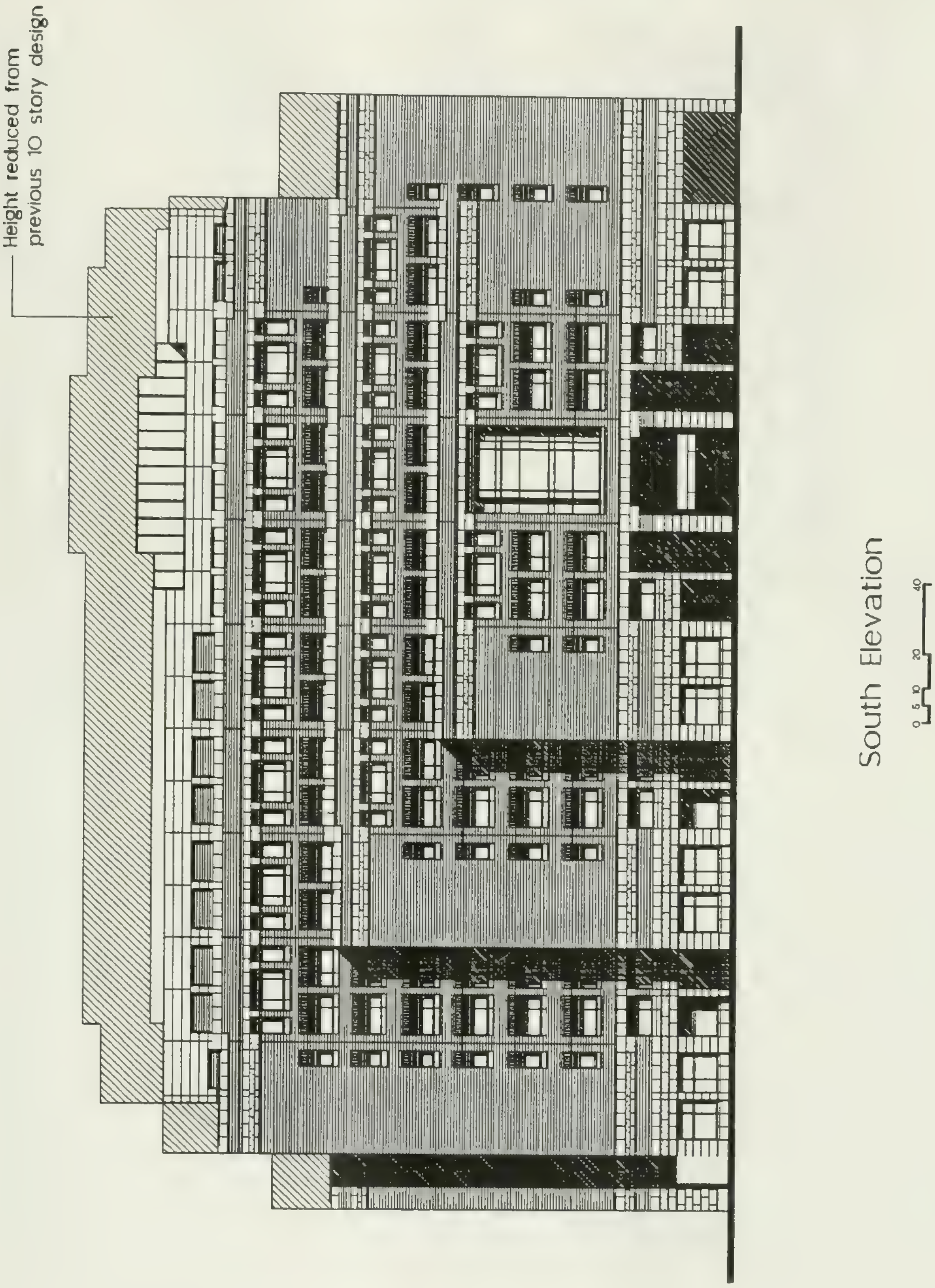
BOSTON UNIVERSITY SCHOOL OF MANAGEMENT

View from Metcalf Science Plaza Looking North

Figure 3-5

Prepared By:
Pressley Associates, Inc.

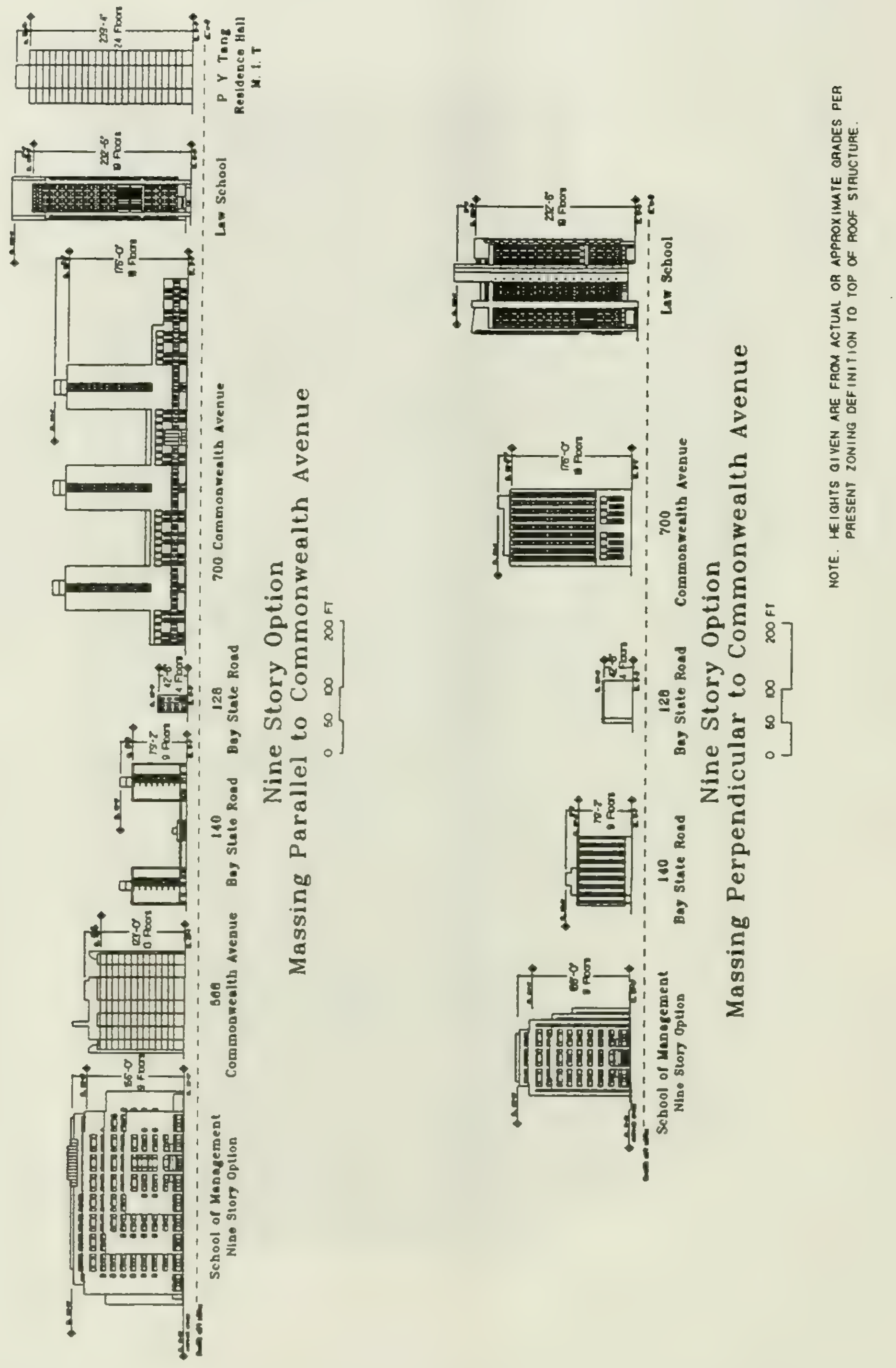
July 1993



Nine and Ten Story Building Profile Overlay

Prepared By: Cannon

Figure 3-6



Nine Story Option
Massing Parallel to Commonwealth Avenue

Nine Story Option
Massing Perpendicular to Commonwealth Avenue

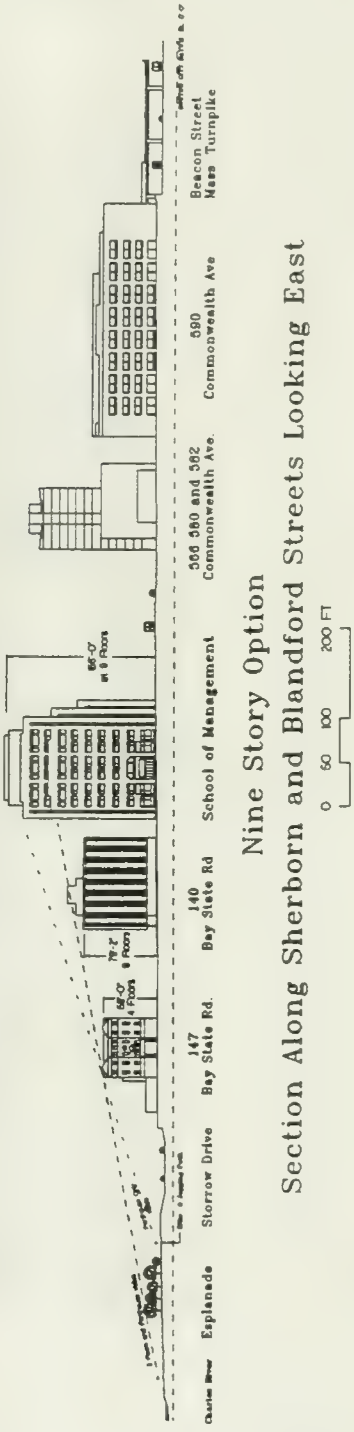
NOTE. HEIGHTS GIVEN ARE FROM ACTUAL OR APPROXIMATE GRADES PER PRESENT ZONING DEFINITION TO TOP OF ROOF STRUCTURE.

Building Massing Study

Prepared By:
Cannon

Figure 3-7

View Angles from Charles River Esplanade



Nine Story Option

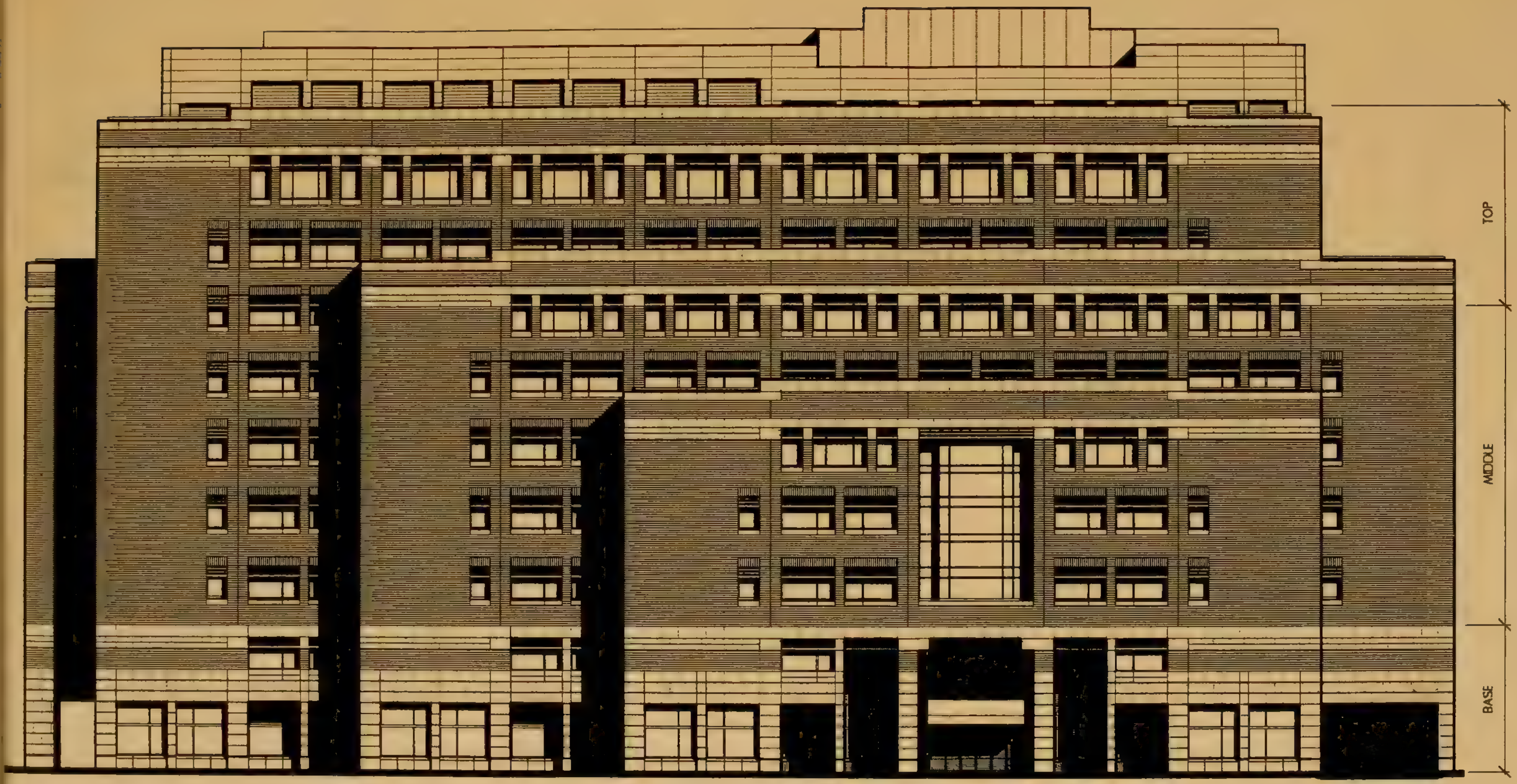
Section Along Sherborn and Blandford Streets Looking East

NOTE: HEIGHTS GIVEN ARE FROM ACTUAL OR APPROXIMATE GRADES PER PRESENT ZONING DEFINITION TO TOP OF ROOF STRUCTURE.

7 JUNE 1993

View Angles from Charles River - South Bank

Prepared By: Cannon	***Figure 3-8***



BOSTON UNIVERSITY
SCHOOL OF MANAGEMENT

SOUTH ELEVATION

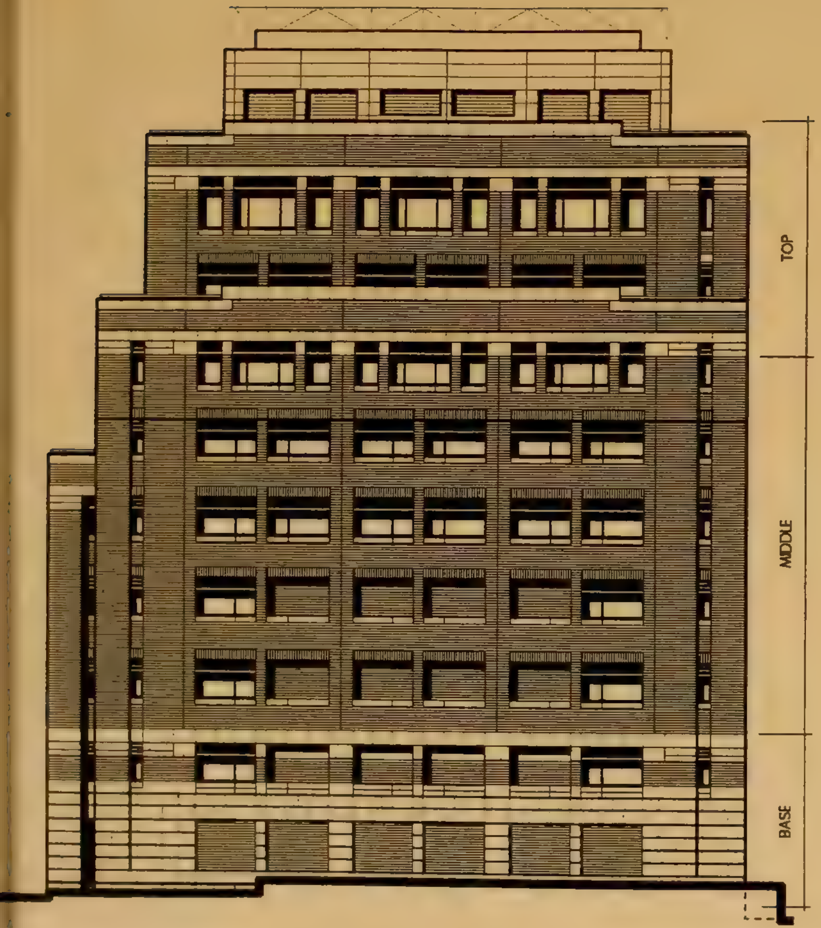
BOSTON UNIVERSITY
SCHOOL OF MANAGEMENT

Facade Treatment
South Elevation

Figure 3-9

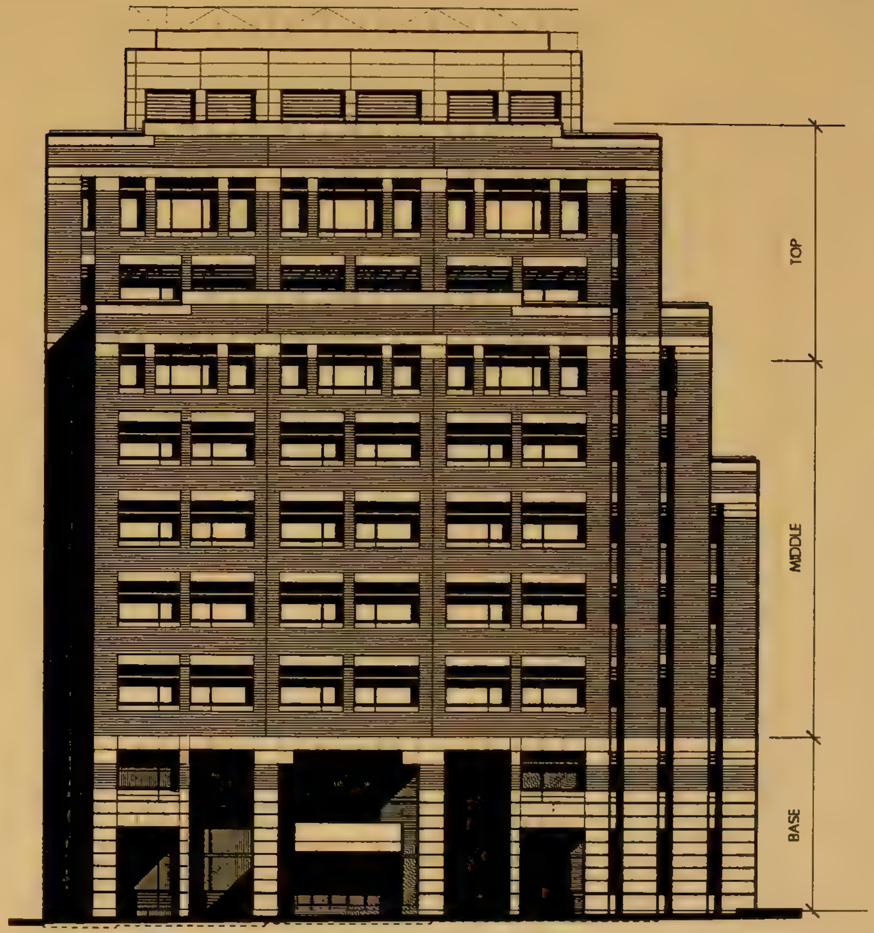
Prepared By:
Pressley Associates, Inc.

July 1993



BOSTON UNIVERSITY
SCHOOL OF MANAGEMENT

EAST ELEVATION



BOSTON UNIVERSITY
SCHOOL OF MANAGEMENT

WEST ELEVATION

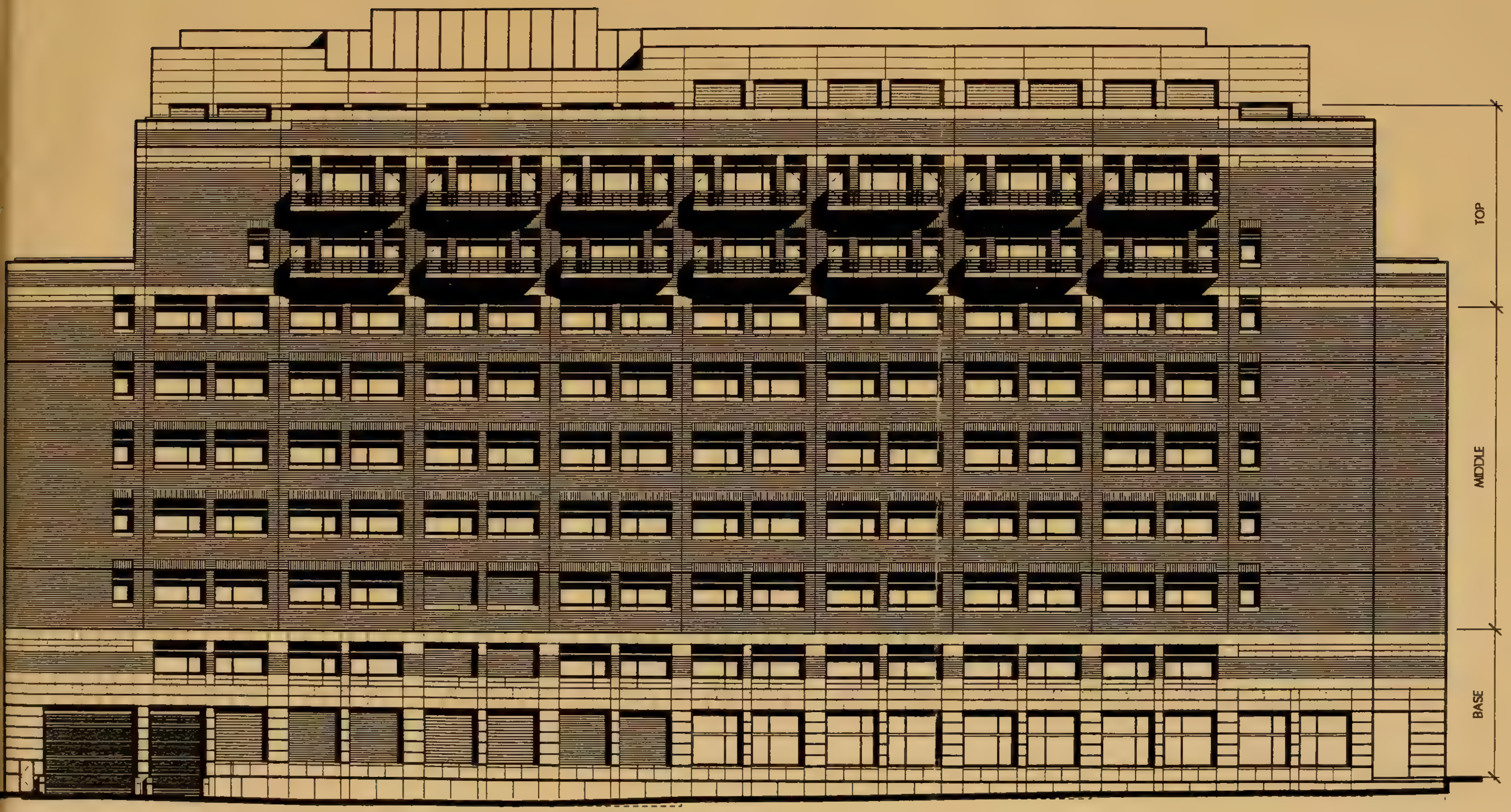
BOSTON UNIVERSITY
SCHOOL OF MANAGEMENT

Facade Treatment
East and West Elevations

Figure 3-10

Prepared By:
Pressley Associates, Inc.

July 1993



BOSTON UNIVERSITY
SCHOOL OF MANAGEMENT

NORTH ELEVATION

BOSTON UNIVERSITY
SCHOOL OF MANAGEMENT

Facade Treatment
North Elevation

Figure 3-11

Prepared By:
Pressley Associates, Inc.

July 1993

of Management building employs the same materials in a similar motif but incorporates more stone at the base and cornices. The building reinforces the recent architectural style on the campus.

Ralph Adam Cram's original School of Management (685 Commonwealth Avenue) is surrounded by many of the newer buildings on campus and the site of the new School of Management. Through the use of the light colored stone base as a unifying element, the flanking buildings frame Cram's Building and highlight it as a focal point of the Campus.

Like many of the buildings in the area, the Project's facade is divided into three horizontal sections: base, middle, and top. The base of the building consists of an articulated ground level with transparent storefront glazing and a loggia located at both entries.

The base of the building begins with a three foot high band of granite starting at grade level, upon which is 27 feet of banding. Similar to the way in which it is used in surrounding buildings such as the Boston University Bookstore Mall in Kenmore Square, the height of the base in proportion to a person walking next to the building will give the perception of a stone structure (relating it to Ralph Adam Cram's existing School of Management building). Yet as one views the building from a distance, the intermixing of brick and stone become apparent.

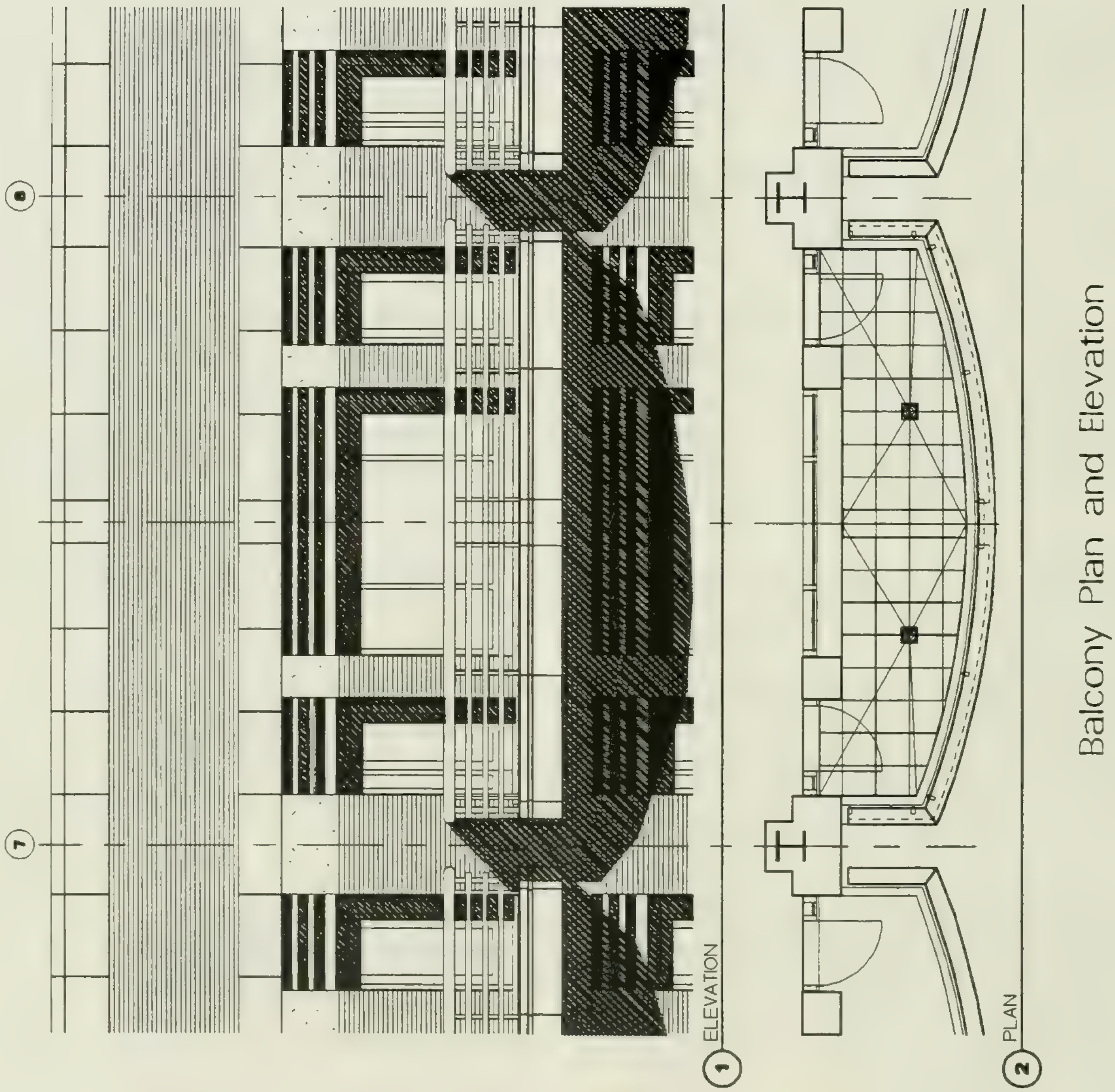
The middle of the building is emphasized by the expanse of red brick separated from the base by limestone bands and the use of deepset punched windows with sunscreens.

The top of the building is defined by upper and lower bands of light colored pre-cast material, a different rhythm of fenestration from other portions of the building. The building is completed by the articulation of the penthouse and skylight modulation producing a focal point in the skyline. Figures 3-9, 3-10, and 3-11 illustrate the base, middle and top elevations of the north, south, east, and west facades.

On the north side of the new School of Management building, curved balconies were incorporated into the facade to bring texture reminiscent of the Bay State Road townhouses. (see Figure 3-12). This feature contributes to the visual continuity of the townhouses as viewed from the Charles River.

3.4 SITE ACCESS

Discussion of access to the site can be subdivided into two categories: service access and user access. The latter category can be further subdivided into pedestrian access and vehicular access.



North Face Balcony Detail

Prepared By:
Fort Point Associates

Figure 3-12

User Access

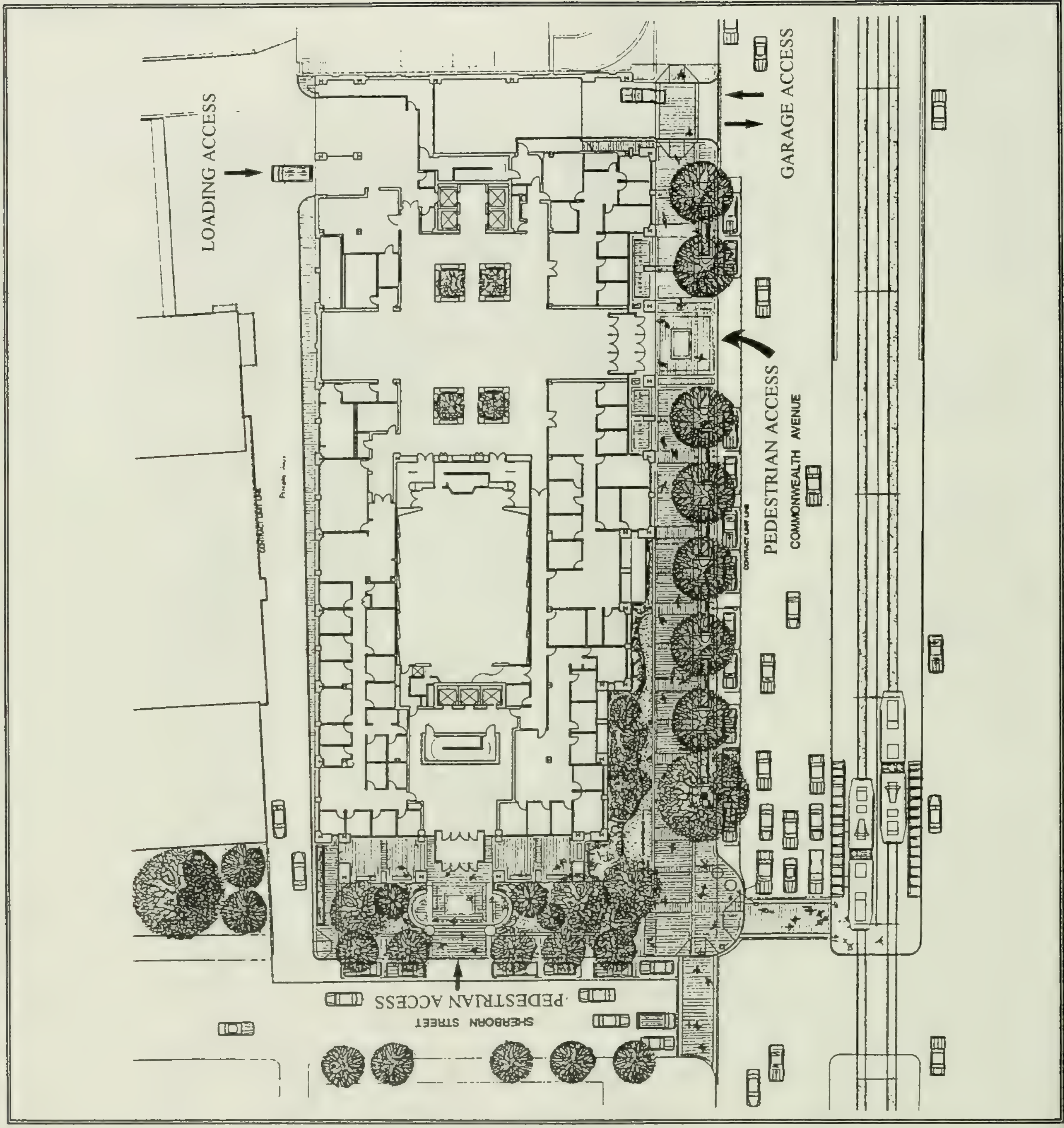
The predominant path of approach to the site from elsewhere on campus is along Commonwealth Avenue. Many people regularly arrive by MBTA bus and trolley along Commonwealth Avenue or on foot from Kenmore Square. Others walk from nearby dormitories, residences, businesses and parking lots along Commonwealth Avenue. For this reason, the principal entrance for University personnel, students, and visitors is located along Commonwealth Avenue. This entrance will serve the first six floors of the building containing the School of Management.

The major flux of people in and out of the executive administrative offices will occur at 9:00 AM, noon, and 5:00 PM, with a reduced flow throughout the day and into evening hours. In order that this entrance not compete or conflict with the principal entrance, it will be appropriately located on Sherborn Street.

The entrance to the parking garage is located at the eastern corner of the building, on Commonwealth Avenue, thus avoiding conflict with traffic on Sherborn Street and near the traffic signal. Commonwealth Avenue is a divided roadway in front of the new building. Since traffic is westbound along that portion of Commonwealth Avenue, vehicles parking in the building will turn off the street prior to reaching the major pedestrian crossing at Sherborn Street and the MBTA bus and trolley stops farther to the west. This design reduces potential conflicts between vehicles and pedestrians and minimizes disruption of traffic flow. Cars are able to enter and exit the parking facility without significantly disrupting traffic flow.

Service Access

The Project site is bounded by an alley on the north, which connects to Sherborn and Deerfield Streets. The loading docks are located off the alley in such a way that they will not impede alley circulation. Currently, the dormitories and other residential properties are served by this alley. Not only is this alley the obvious location for service access to the building, but it is also the most convenient. Actual loading and deliveries will be through three loading bays, one of which is for a dumpster in the rear of the building away from pedestrian areas. These will be accessed from the alley and segregated from other access points to the building. Service vehicles will be able to enter and exit the alley from either Deerfield or Sherborn Streets. These streets, in turn, afford easy access to Commonwealth Avenue at traffic signals. Access points are shown in Figure 3-13. This location also allows easy coordination of truck loading and deliveries to the Boston University dormitory, also located off the alley.



Pedestrian Building Access

Prepared By:
Fort Point Associates

Figure 3-13

4.0 WIND

4.0 WIND

4.1 INTRODUCTION

A quantitative study of the pedestrian-level wind environment for a No-Build condition and Build condition was undertaken for the Boston University School of Management project site in Boston, Massachusetts. For this analysis, Build condition refers to the nine story alternative, approximately 166 feet in height. The main objectives of this study were to:

1) quantitatively assess the effect that the new Boston University School of Management project would have on pedestrian-level wind conditions;

2) compare the predicted wind conditions with criteria outlined by the Boston Redevelopment Authority (BRA); and,

3) develop mitigation measures for identified problem areas, if necessary.

Prior to conducting the quantitative study, a qualitative review of the Project was conducted and included in the DPIR, dated February, 1993. The qualitative review identified that the wind conditions produced by the original ten story alternative would, in general, be suitable for the various intended pedestrian uses, however, there were some areas where increased wind activity would be of concern. The design team responded to this by reducing the height of the building to nine stories , approximately 166 feet above grade and developing a detailed landscaping scheme. Quantitative tests showed that the nine story project had a positive impact on wind conditions and provided adequate mitigation, based on the BRA pedestrian wind criteria, in several areas of concern along Sherborn Street and Commonwealth Avenue.

A brief summary of the quantitative test results follows.

(i) Overall, the Build condition creates moderately better wind conditions than those which exist under the No-Build scenario.

(ii) Under the Build scenario, the seasonal and annual wind conditions along Sherborn Street are well-suited for pedestrian use. Wind conditions are noticeably improved when compared to the No-Build conditions.

(iii) Wind conditions along Commonwealth Avenue, under the Build scenario, are within the acceptable levels of comfort as defined by the BRA, with the exception of the MBTA pedestrian waiting area located on the median. (Generally, the wind velocities in the MBTA area just exceed the acceptable level of comfort for walking by 1 mph).

(iv) The seasonal and annual wind conditions in the open space at Commonwealth Avenue and Blandford Street are very well-suited for intended uses.

(v) The seasonal and annual wind climate at the adjoining Howard Johnson's Motor Lodge property is appropriate for pedestrians using the facility.

(vi) The seasonal and annual wind climate in the adjacent private alley and Boston University dormitory are appropriate for pedestrian use.

(vii) The main entrances to the new School of Management, on Sherborn Street and Commonwealth Avenue, are subject to appropriate seasonal and annual wind conditions.

(viii) Locations within the Bay State Road historic district (along Sherborn Street and in the vicinity of the Boston University dormitory) largely improve with the Build condition. One location along Sherborn Street (Location 3) is brought below the effective gust threshold. Wind speeds increase in the alley, but remain within the BRA acceptable comfort ranges.

The study was based on a 1:400 scale model of the proposed Project and surroundings, tested in a boundary layer wind tunnel. Information concerning the surrounding area was based on topographical maps, aerial photographs, information supplied by the BRA, information supplied by Cannon Architects, and building information obtained from the Sanborn Map Company. Additional information concerning site characteristics was obtained during a site visit.

The quantitative test results were achieved by including the detailed landscaping plan prepared by Pressley Associates, Inc. This landscape plan forms part of the Project and is considered to be an integral part of the Build condition.

The summer, spring and fall test results are conservative since the landscaping included on the test model was portrayed as winter vegetation (i.e. deciduous trees with no foliage). For this reason, actual wind conditions during these periods will be equal to or better than those reported in this document.

4.2 OVERVIEW

Major buildings, especially those that protrude above their surroundings, often cause increased local wind speeds at the pedestrian level. Typically, wind speeds increase with elevation above the ground surface, and taller buildings intercept these faster winds and deflect them down to the pedestrian level. The funneling of wind through gaps between buildings and the acceleration of wind around corners of buildings may also cause increases in wind speed. Conversely, if a building is surrounded by others of equivalent height, it may be protected from the prevailing upper-level winds, resulting in no significant changes to the local pedestrian-level wind environment. The most effective way to assess potential pedestrian-level wind impacts around this proposed new building is to conduct scale model tests in a wind tunnel.

The consideration of wind in planning outdoor activity areas is important since high winds in an area tend to deter pedestrian use. For example, winds should be light or relatively light in areas were people would be sitting, such as outdoor cafes or playgrounds. For bus stops and other locations where people would be standing, somewhat higher winds can be tolerated. For frequently used sidewalks, where people are primarily walking, stronger winds are acceptable. For infrequently used areas, the wind comfort criteria can be relaxed even further. The actual effects of wind can change from pedestrian inconvenience, due to the blowing of dust and other loose material in a moderate breeze, to severe difficulty with walking due to the wind forces on the pedestrian.

4.3 METHODOLOGY

For this analysis of pedestrian-level wind conditions, the following conditions were tested:

No-Build Condition - includes all existing surrounding buildings and no construction on the Project site, see Figure 4-1.

Build Condition - includes the same existing surroundings as the No-Build configuration, however, it includes the proposed School of Management nine story alternative, approximately 166 feet high, see Figure 4-2.

The 1:400 scale model of the two test conditions and surroundings within a 1,600-foot radius of the Project site, was tested in the Rowan Williams Davies & Irwin, Inc. (RWDI) boundary layer wind tunnel. The wind tunnel simulates the natural wind conditions in the area. A detailed description of the wind tunnel and the simulation of the natural wind is given in Appendix E1.

The model was initially fitted with thirty-two omnidirectional wind speed sensors that were connected to the wind tunnel's data acquisition system to record the mean and fluctuating components of wind speed at a full-scale height of 5 feet above grade. Two additional sensors were added for the Build condition in response to concerns expressed about possible wind impacts at other locations on Commonwealth Avenue. The photographs in Figure 4-1 show the model in the No-Build condition, while the photographs in Figure 4-2 depict the model in the Build test condition. Landscaping, apart from a row of existing coniferous trees at the Boston University dormitory, was not included on the model for the No-Build condition. A comparison of pedestrian-level winds at each sensor location for each test condition identifies the impact of the Project.

Wind speeds were recorded and analyzed for sixteen wind directions, in 22.5 degree increments, starting from true north. The test data were then combined with long-term meteorological data, recorded during the years 1945 to 1988 at Boston's Logan International Airport, in order to predict actual wind speeds. For this study, hourly wind records for each of the four seasons and over the entire year were analyzed. These wind statistics, graphically presented in Figure 4-3 through Figure 4-5 as "wind roses", summarize the annual and seasonal conditions for wind speed, and direction in the Boston area.

The first two wind roses in Figure 4-3 provide a summary of the spring (March, April, and May) wind data for Logan International Airport. When considering all spring winds, the prevalent wind directions are from the north-northwest, northwest, west and east. However, when only the pedestrian-level winds (i.e. 5 feet above ground level) that exceed 16 miles per hour (mph) (Strong Spring Winds) are included in the analysis, the most prominent directions are from the west through northwest, northeast and east-northeast. It should be noted that the 16 mph threshold speed will occur, on average, 1 percent of the time during the spring season in the Boston area.

The second two wind roses in Figure 4-3 illustrate the prevailing summer (June, July, and August) winds blowing from the south-southwest through west-northwest, north-northwest when considering all winds. When only the winds above the 1 percent probability wind speed of 12 mph (note: this wind speed changes slightly with the season) are considered, winds from the southwest, west-northwest, west-southwest, northwest and northeast are predominant.

During the fall months (September, October, and November), winds favor the southwest through northwest, when considering all winds (see top left wind rose in Figure 4-4). However, when considering winds above the one percent probability threshold of 15 mph (Strong Fall Winds), the west-northwest, northwest, northeast and east-northeast winds prevail (see top right wind rose in Figure 4-4).

For the winter (December, January, and February) wind conditions, the lower left wind rose in Figure 4-4 indicates that the prevailing directions are from the west through northwest, when considering all winds. However, for winds above the 1 percent probability wind speed of 17 mph (Strong Winter Winds), the predominant winds are from the west-northwest, northwest and east-northeast, (see lower right wind rose in Figure 4-4). Figure 4-5 summarizes the annual wind data. The top wind rose illustrates that the southwest, west, west-northwest, northwest, northeast and east-northeast winds prevail, when considering all winds. For winds above the 16 mph threshold wind speed (Strong Annual Winds), the prevailing wind directions are from the west-northwest, northwest, west, northeast and east-northeast, as shown in the bottom wind rose in Figure 4-5.

This study used state-of-the-art measurement and analysis techniques to predict the level of comfort expected at each test location. There are, however, three sources of variability that should be considered. First, although the methods of measurement and analysis were performed with precision, the sensation of comfort among individuals can be quite variable. Variations in age, individual health, clothing, and other human factors can change the response of a particular individual. The comfort limits used in this report represent an average for the total population. Second, unforeseen changes in the Project area, such as the construction or removal of buildings, could affect wind conditions experienced at the site. Third, the prediction of wind speeds is necessarily a statistical procedure. The wind speeds reported are for the frequency of occurrence stated (1 percent). Higher wind speeds will occur but on a less frequent basis.

4.4 PEDESTRIAN WIND COMFORT CRITERIA

The BRA has adopted two standards for assessing the relative wind comfort of pedestrians. First, the BRA wind design guidance criteria states that an effective gust velocity (mean hourly wind speed +1.5 times the root-mean-square wind speed) exceeded 1 percent of the time should not exceed 31 mph. The second set of criteria used by the BRA to determine the acceptability of specific locations is derived from the Melbourne criteria. These criteria are used to determine the relative level of pedestrian wind comfort for activities such as sitting, standing, or walking. The criteria measured according to mean wind speeds are essentially as follows:

Table 4-1 BRA Mean Wind Criteria*

Dangerous Conditions	>27
Uncomfortable for Walking	>19 and ≤27
Comfortable for Walking	>15 and ≤19
Comfortable for Standing	>12 and ≤15
Comfortable for Sitting	≤12

* Mean wind speed (mph) exceeded 1 percent of the time. Based on Melbourne wind criteria.

The wind climate found in a typical urban setting in Boston is generally comfortable for sidewalks and pedestrian thoroughfares. However, without any mitigation measures, this wind climate is likely to be uncomfortable for more passive activities such as sitting. The wind climate in Boston will generally satisfy the BRA effective gust velocity criteria of 31 mph.

4.5 TEST RESULTS

The pedestrian-level wind data supporting the following discussion of the test results is located in Appendices E2 and E3 and Tables 4-11 and 4-12. It includes the predicted mean wind speeds, the level of pedestrian wind comfort, and the effective gust speeds for the thirty-four test locations.

The annual and seasonal mean and effective gust wind speeds are identified on plans of the study area (Figure 4-6 through Figure 4-15). Figure 4-6 through Figure 4-10 identify the annual and seasonal mean wind velocities at each sensor location for the two test conditions. Figure 4-11 through Figure 4-15 identify the annual and seasonal effective gust wind velocity at each sensor location for the two test conditions. Figure 4-16 identifies a plan view of the study area.

For additional information concerning the effects of each wind direction at any test location (i.e. mean wind speed and peak gust), refer to Appendix E3. Presented as wind speed ratios, the data represent the ratio of the wind speed recorded at each sensor location (i.e. five feet above grade) to the mean wind speed which occurs at gradient height. These ratios indicate the directions from which the wind speeds are locally accelerated, along with their weighting factors. If strong acceleration occurs for a wind direction that also occurs frequently, then problem wind conditions can be expected. The use and interpretation of these test data are described in Appendix E3.

4.6 PEDESTRIAN-LEVEL WIND ASSESSMENT

The following is a summary of the predicted pedestrian-level wind conditions in and around the Project site for the No-Build and Build study conditions. The results of the wind analysis have been compared to the BRA wind criteria.

4.6.1 ASSESSMENT OF MEAN WIND SPEEDS

The test results for each of the thirty-four wind sensor locations are discussed in groupings according to the specific locations representing the following areas: Sherborn Street; Commonwealth Avenue; open space at Commonwealth Avenue and Blandford Street; Howard Johnson's Motor Lodge; alley; and the Boston University dormitory at Sherborn Street and Bay State Road. For example, Sherborn Street is comprised of test Locations 1 through 12. These are discussed under the Sherborn Street grouping for both test configurations studied.

The pedestrian-level wind effect in each study area is described in the following text. A table which summarizes the number of locations suitable for either sitting, standing, and walking, for all seasons and all test configurations, has been included at the end of each area analysis. For example, out of twelve test locations along Sherborn Street, nine were suitable for either sitting, standing or walking under the No-Build configuration, during the spring season. With the Build configuration in place, all twelve locations were comfortable for either sitting, standing or walking during the spring season.

Sherborn Street

No-Build. Under No-Build conditions, the wind climate along Sherborn Street was suitable for sitting, standing, or walking at nine of the twelve locations during the spring and annually. All twelve locations were comfortable for walking or better during the summer months. Ten locations had appropriate wind conditions in the fall and eight locations were comfortable for sitting, standing or walking during the winter months. Uncomfortable wind conditions occurred at Locations 3 and 5 during the spring, fall, winter and annually and at Location 6 during the spring, winter and annually. Wind speeds uncomfortable for walking occurred at Location 1 in the winter.

Build. The Build condition produced improved seasonal and annual wind comfort levels when compared to the No-Build condition. During the spring, summer, fall, and annually, all twelve locations were suitable for sitting, standing or walking. Wind conditions just exceeding comfortable for walking were recorded at Location 12 during the winter. The main entrance to the building (Location 6) had very well-suited seasonal and annual wind conditions. The wind conditions within the Bay State Road historic district largely improve with the Build condition (i.e. Locations 1, 2, 3 and 4).

Table 4-2 presents the results of the wind analysis for the twelve locations studied along Sherborn Street.

Table 4-2 Sherborn Street Wind Conditions: Number of Locations Suitable for Sitting, Standing, or Walking*

Season	No-Build	Build
Annual	9	12
Spring	9	12
Summer	12	12
Fall	10	12
Winter	8	11

* Twelve locations were tested on Sherborn Street for both test configurations: Locations 1 through 12.

Commonwealth Avenue

No-Build. With the exception of Location 21, all locations on a seasonal and annual basis, were predicted to be suitable for either sitting, standing, or walking. Wind conditions just exceeding comfortable for walking occurred at Location 21 during the winter.

Build. The Build condition primarily produced seasonal and annual wind climates comparable to the No-Build condition. Wind conditions just exceeding comfortable for walking were recorded at Location 17 during the spring, fall, winter, and annually and at Location 33 during the winter months. Locations 17 and 33 represent pedestrian waiting areas for the MBTA on the Commonwealth Avenue median. These test results did not consider any pedestrian shelters. The recorded wind speeds at the main entrance to the building (Location 18) were more than adequate on a seasonal and annual basis. The wind speeds at Locations 21 and 23, near Kenmore Towers and Kenmore Square, improved with the Build condition.

Table 4-3 presents the results of the wind analysis for the locations studied along Commonwealth Avenue.

Table 4-3 Commonwealth Avenue Wind Conditions: Number of Locations Suitable for Sitting, Standing, or Walking*

Season	No-Build	Build
Annual	10	11
Spring	10	11
Summer	10	12
Fall	10	11
Winter	9	10

* Ten locations were tested for the No-Build Condition: Locations 13, 14, 16-23.
* Twelve locations were tested for the Build Condition: Locations 13, 14, 16- 23, 33 and 34.

Open Space - Commonwealth Avenue and Blandford Street

No-Build. Wind speeds were predicted to be suitable for sitting during the summer, fall, and annually. The wind speeds were suitable for standing during the spring and winter months.

Build. The Build condition produced comparable wind speeds suitable for sitting during the summer and fall and standing during the spring, winter, and annually.

Table 4-4 presents the results of the wind analysis for the one location studied in the open space.

Table 4-4 Open Space Wind Conditions: Number of Locations Suitable for Sitting, Standing, or Walking*

Season	No-Build	Build
Annual	1	1
Spring	1	1
Summer	1	1
Fall	1	1
Winter	1	1

* One location tested in the open space for both test configurations: Location 15.

Howard Johnson's Motor Lodge

No-Build. All test locations were subject to wind conditions suitable for the pedestrian use of the facility, seasonally, and on an annual basis.

Build. Wind speeds were lower than the No-Build condition at Locations 24 and 26 on a seasonal and annual basis. Wind speeds generally increased at Location 25 but the wind climate remained well-suited for the intended pedestrian usage, reflecting conditions conducive to standing or walking.

Table 4-5 presents the results of the wind analysis for the three locations studied at the Howard Johnson's Motor Lodge.

Table 4-5 Howard Johnson's Motor Lodge Wind Conditions: Number of Locations Suitable for Sitting, Standing, or Walking*

Season	No-Build	Build
Annual	3	3
Spring	3	3
Summer	3	3
Fall	3	3
Winter	3	3

* Three locations were tested at the Howard Johnson's Motor Lodge for both study configurations: Locations 24, 25 and 26.

Alley

No Build. Under the No-Build condition, the wind environment was appropriate for sitting, standing, or walking at all four test locations, seasonally and annually.

Build. The Build condition was predicted to produce wind conditions similar to the No-Build condition at Locations 27 and 28 with increased wind speeds at Locations 29 and 30. The increase in wind velocity is the result of the channeling of winds between the Boston University dormitory and the new School of Management. The increased wind speeds were still well within acceptable limits of pedestrian comfort.

Table 4-6 presents the results of the wind analysis for the four locations studied along the alley.

Table 4-6 Alley Wind Conditions: Number of Locations Suitable for Sitting, Standing, or Walking*

Season	No-Build	Build
Annual	4	4
Spring	4	4
Summer	4	4
Fall	4	4
Winter	4	4

* Four locations were tested at the Alley for both study configurations: Locations 27 through 30.

Boston University Dormitory

No Build. Both locations registered wind speeds comfortable for either sitting or standing on a seasonal and annual basis.

Build. Within this section of the Bay State Road historic district, wind conditions marginally improved over the No-Build condition and are well suited for the area's intended pedestrian use. The seasonal and annual wind conditions in the interior courtyard (Location 31) became comfortable for sitting. Wind speeds suitable for sitting occurred at Location 32 during the spring, summer, fall and annually. In the winter, the wind speeds were suitable for standing.

Table 4-7 presents the results of the wind analysis for the two locations studied at the Boston University dormitory.

Table 4-7 Boston University Dormitory Wind Conditions: Number of Locations Suitable for Sitting, Standing, or Walking*

Season	No-Build	Build
Annual	2	2
Spring	2	2
Summer	2	2
Fall	2	2
Winter	2	2

* Two locations were tested at the Boston University dormitory for both study configurations: Locations 31 and 32.

4.6.2 ASSESSMENT OF EFFECTIVE GUST SPEEDS

A detailed area by area discussion of the effective gust conditions is not presented in the wind analysis since all but one area (three locations) meet the BRA criteria under the No-Build conditions. All areas and locations under the Build condition meet the BRA criteria. Table 4-8 presents the results of the wind analysis of effective gust for all locations studied on and around the new School of Management site.

No-Build. The area along the east side of Sherborn Street, at the alley, is subject to high wind activity exceeding the BRA effective gust criteria. The specific locations are: Location 3, which fails the criteria during the winter season and is borderline during the spring and annually; Location 5, which fails during the spring, winter and annually; and, Location 6, which fails during the winter and is a borderline condition in the spring.

Build. All locations meet the BRA effective gust criteria, with substantial improvement noted along Sherborn Street particularly at Locations 3, 5, 6, and 7. Under the Build scenario, the highest effective gust value measured is 29 mph at Locations 17 and 34 during the winter season.

Table 4-8 Number of Locations Meeting the Effective Gust Criteria*

Season	No-Build	Build
Annual	31	34
Spring	31	34
Summer	32	34
Fall	32	34
Winter	29	34

* Thirty-two locations were tested for the No-Build study condition: Locations 1 through 32.
* Thirty-four locations were tested for the Build study condition: Locations 1 thorough 34.

4.7 MITIGATION MEASURES

The quantitative test for the Build scenario combined a detailed landscape design with the reduced nine story alternative, approximately 166 feet in height. This Build scenario test provided very positive results because wind activity was reduced in various areas of concern (noted in the qualitative report in the DPIR, February 19, 1993) creating comfortable wind conditions. The improvement was most noticeable along Sherborn Street and along Commonwealth Avenue. The results for the quantitative wind tunnel tests also indicated there were no locations which exceeded the effective gust criteria; and only three locations that just exceeded conditions comfortable for walking, namely Locations 17 and 33 representing the MBTA trolley stop pedestrian waiting areas on Commonwealth Avenue, and Location 12 at Commonwealth Avenue and Blandford Street.

Locations 12 and 33 just exceed the comfortable for walking criteria only during the winter months. Location 17 exceeds comfortable for walking during the spring, fall, winter and annually. These locations are exposed primarily to east-northeast, northeast, northwest and north-northwest winds interacting with the new School of Management to the north of Commonwealth Avenue.

In the absence of the new School of Management project, the aforementioned winds flowed unhindered along Commonwealth Avenue and dissipated in the large open parking area, that is the current Project site. With the addition of the Project to the test model, these winds were intercepted and redirected along Commonwealth Avenue, resulting in the increased wind activity at Locations 12, 17 and 33.

With respect to the MBTA trolley stop waiting areas (Locations 17 and 33), the wind tunnel tests were conducted without pedestrian waiting shelters. The addition of these, or other wind control devices, will create an adequate condition for pedestrians during those time periods when increased wind speeds occur. The University is currently working with the MBTA to define the design and location of such shelters. Location 12, at the west corner of Commonwealth Avenue and Blandford Street, just exceeds the walking comfort criteria by 1 mph in the winter only. Conditions are considered comfortable for all other seasons and annually. For this reason, additional wind mitigation is not necessary.

4.8 CONCLUSION

Overall, the Project will have a very positive impact on the local wind conditions including areas within the Bay State Road historic district. For the Build scenario, the wind speeds were generally equal to or less than the No-Build Conditions. None of the thirty-four locations recorded wind speeds that exceeded the BRA gust criteria of 31 mph and only three out of thirty-four locations reported wind conditions that just exceeded conditions comfortable for walking.

The new School of Management will partially intercept and deflect upper-level winds down to grade. In the few areas of anticipated high wind activity, conditions are primarily due to the exposure of these areas to predominant northeast and northwest quadrant winds, and the channeling of these winds between and around existing and proposed buildings. Wind control devices, such as a pedestrian shelter, are being discussed with the MBTA to counter the predicted increased wind activity at the MBTA waiting areas.

The wind conditions presented in this report were achieved by the nine story alternative (approximately 166 feet in height) and a detailed landscaping plan. Any significant changes to either of these may affect the wind conditions on and around the Project site.

*Table 4-9 Number of Locations Suitable for Sitting, Standing, or Walking**

Season	No-Build	Build
Annual	29	33
Spring	29	33
Summer	32	34
Fall	30	33
Winter	27	31

* Thirty-two locations were tested for the No-Build condition: Locations 1 through 32.

* Thirty-four locations were tested for the Build condition: Locations 1 through 34.

*Table 4-10 Number of Locations Meeting the Effective Gust Criteria**

Season	No-Build	Build
Annual	31	34
Spring	31	34
Summer	32	34
Fall	32	34
Winter	29	34

* Thirty-two locations were tested for the No-Build study condition: Locations 1 through 32.

* Thirty-four locations were tested for the Build study condition: Locations 1 through 34.

Table 4-11: Summary of Mean Wind Speeds

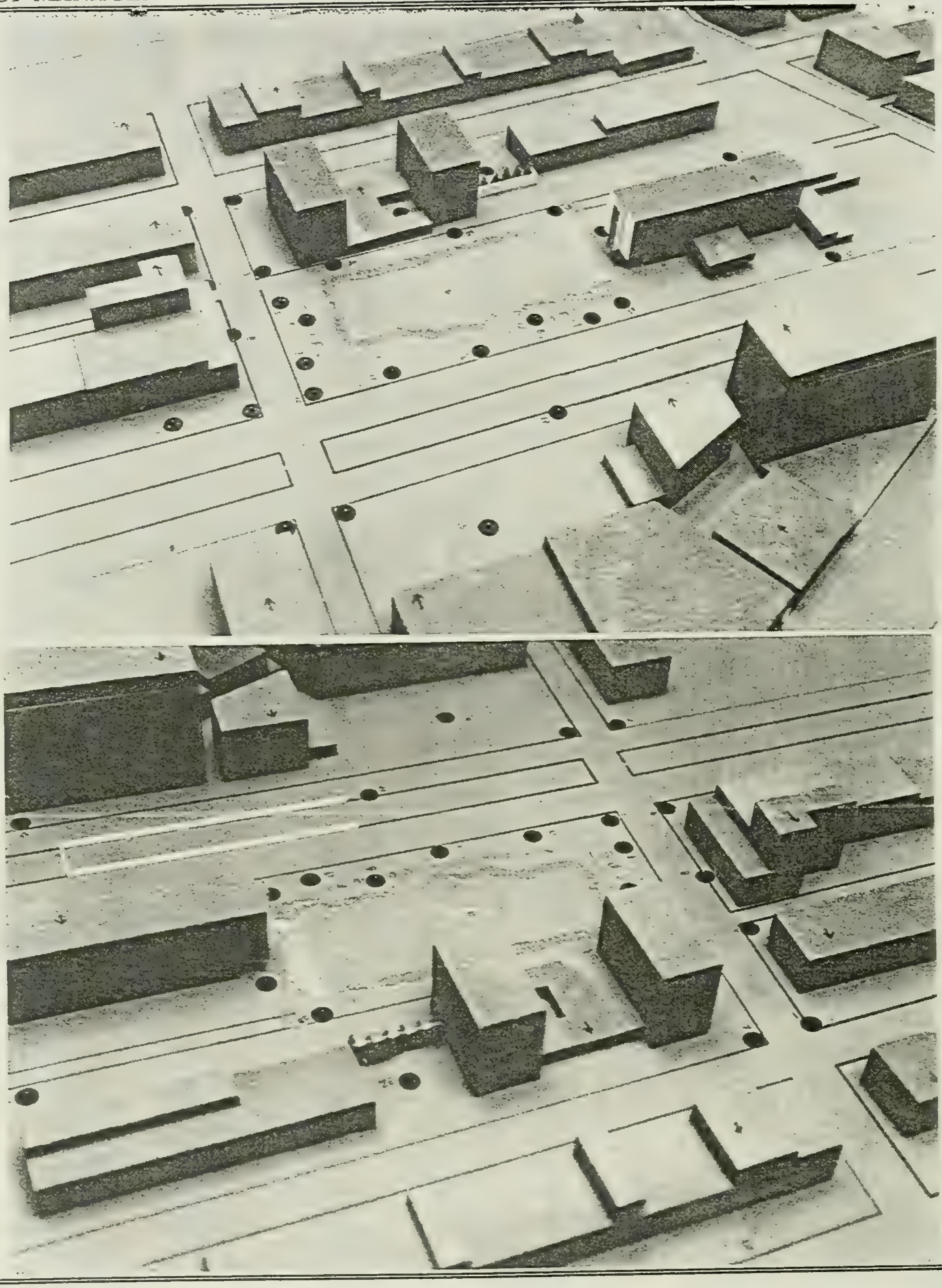
Location	Configuration	Spring	Summer	Fall	Winter	Annual
Sherborn Street						
1	No-Build	19	15	18	21	19
	Build	16	12	15	18	16
2	No-Build	18	15	18	19	18
	Build	17	14	16	18	17
3	No-Build	23	17	21	25	22
	Build	16	12	15	18	16
4	No-Build	15	12	14	16	15
	Build	13	11	13	14	13
5	No-Build	24	17	22	26	23
	Build	11	9	11	12	11
6	No-Build	21	15	19	24	21
	Build	10	8	10	11	10
7	No-Build	15	13	15	17	15
	Build	14	13	13	13	13
8	No-Build	12	10	12	13	12
	Build	16	13	15	15	15
9	No-Build	16	13	16	16	16
	Build	13	12	13	14	13
10	No-Build	15	12	14	15	15
	Build	15	13	14	15	15
11	No-Build	17	13	16	18	16
	Build	17	13	17	19	17
12	No-Build	17	13	17	19	17
	Build	18	14	18	20	18
Commonwealth Avenue						
13	No-Build	15	13	15	16	15
	Build	14	12	14	15	14
14	No-Build	15	12	14	16	15
	Build	14	11	14	15	14
16	No-Build	17	13	16	17	16
	Build	16	13	15	16	15
17	No-Build	19	14	17	18	17
	Build	20	16	20	21	20
18	No-Build	16	13	15	16	15
	Build	9	7	8	9	9
19	No-Build	17	13	16	16	16
	Build	17	14	16	17	17
20	No-Build	16	12	15	15	15
	Build	14	12	14	14	14
21	No-Build	18	14	17	20	18
	Build	14	11	13	14	14

Location	Configuration	Spring	Summer	Fall	Winter	Annual
Commonwealth Avenue (Continued)						
22	No-Build	14	11	14	15	14
	Build	15	13	15	15	15
23	No-Build	14	11	13	15	14
	Build	13	10	12	14	13
33	No-Build	NT	NT	NT	NT	NT
	Build	19	15	19	21	19
34	No-Build	NT	NT	NT	NT	NT
	Build	19	15	18	19	18
Open Space						
15	No-Build	13	10	12	13	12
	Build	13	10	12	14	13
Howard Johnson's Motor Lodge						
24	No-Build	17	16	17	18	17
	Build	14	13	14	14	14
25	No-Build	14	11	13	15	14
	Build	19	13	17	17	17
26	No-Build	17	15	16	17	17
	Build	12	10	12	13	12
Alley						
27	No-Build	16	13	16	18	16
	Build	18	14	17	19	18
28	No-Build	15	13	15	16	15
	Build	15	12	14	16	15
29	No-Build	13	11	13	13	13
	Build	16	12	15	17	16
30	No-Build	11	9	10	11	11
	Build	18	14	17	18	17
Boston University Dormitory						
31	No-Build	13	10	12	14	13
	Build	11	8	10	11	10
32	No-Build	14	10	13	14	13
	Build	12	10	12	13	12

Table 4-12: Summary of Effective Gust Wind Speeds

Location	Configuration	Spring	Summer	Fall	Winter	Annual
Sherborn Street						
1	No-Build	27	21	26	29	27
	Build	23	17	22	25	22
2	No-Build	26	21	25	27	26
	Build	24	20	23	25	24
3	No-Build	31	23	29	34	31
	Build	24	19	23	26	24
4	No-Build	22	18	22	24	22
	Build	20	17	20	21	20
5	No-Build	33	24	30	36	32
	Build	17	14	16	18	17
6	No-Build	31	22	28	34	30
	Build	14	11	14	15	14
7	No-Build	24	19	22	26	23
	Build	20	18	19	19	19
8	No-Build	18	15	18	19	18
	Build	22	18	21	22	21
9	No-Build	23	20	23	24	23
	Build	20	18	20	21	20
10	No-Build	22	18	21	23	22
	Build	22	19	21	22	21
11	No-Build	25	19	24	26	24
	Build	26	20	24	28	25
12	No-Build	25	19	24	27	25
	Build	26	20	25	28	26
Commonwealth Avenue						
13	No-Build	22	19	22	23	22
	Build	21	19	21	22	21
14	No-Build	22	18	21	23	22
	Build	21	17	20	22	21
16	No-Build	24	19	23	25	24
	Build	22	18	21	23	22
17	No-Build	27	20	25	26	25
	Build	28	23	28	29	28
18	No-Build	23	18	22	24	22
	Build	12	10	12	12	12
19	No-Build	26	19	24	24	24
	Build	24	21	24	24	24
20	No-Build	24	18	23	23	23
	Build	21	18	21	21	21

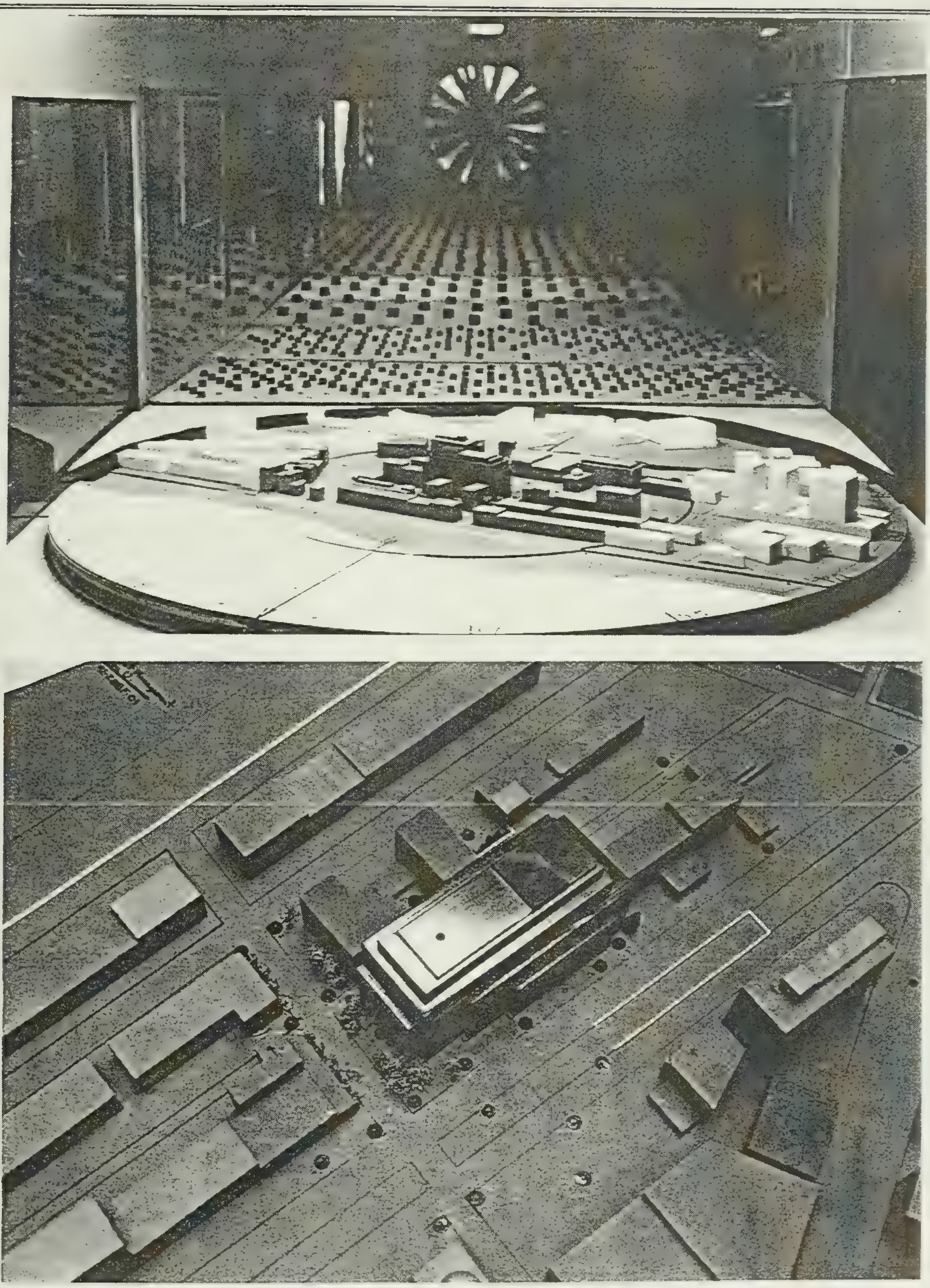
	Configuration	Spring	Summer	Fall	Winter	Annual
Commonwealth Avenue (Continued)						
21	No-Build	26	21	25	28	26
	Build	21	17	20	22	21
22	No-Build	21	17	20	22	21
	Build	22	20	22	23	22
23	No-Build	21	17	20	22	21
	Build	19	15	19	21	19
33	No-Build	NT	NT	NT	NT	NT
	Build	27	22	26	28	27
34	No-Build	NT	NT	NT	NT	NT
	Build	28	22	27	29	27
Open Space						
15	No-Build	20	15	19	20	19
	Build	20	16	20	21	20
Howard Johnson's Motor Lodge						
24	No-Build	25	22	25	26	25
	Build	21	19	21	21	21
25	No-Build	22	17	21	24	22
	Build	26	18	24	24	24
26	No-Build	25	21	24	25	24
	Build	18	15	18	20	18
Alley						
27	No-Build	24	20	23	26	24
	9 Story	25	20	24	27	25
28	No-Build	23	19	22	23	22
	9 Story	23	18	22	25	23
29	No-Build	20	16	20	20	20
	9 Story	24	18	22	25	23
30	No-Build	17	14	16	18	16
	9 Story	26	20	24	26	25
Boston University Dormitory						
31	No-Build	19	16	18	21	19
	9 Story	16	12	15	17	16
32	No-Build	21	16	20	22	21
	9 Story	18	15	18	19	18



Microclimate Study Model - No Build

Prepared By:
Rowan Williams Davies & Irwin, Inc.

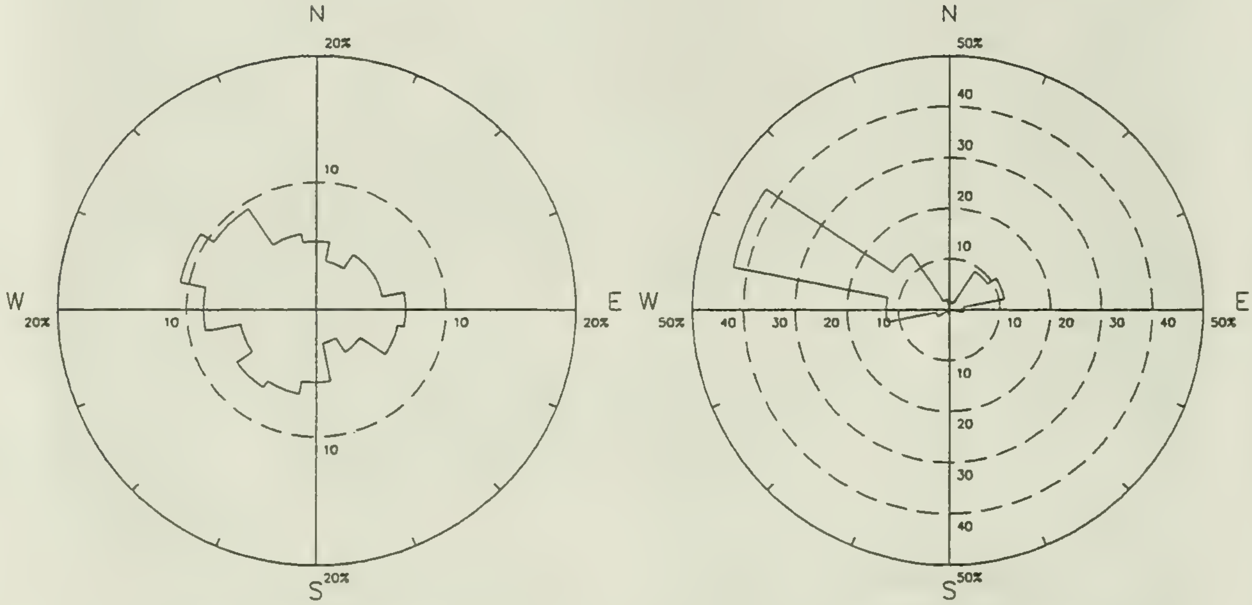
Figure 4-1



Microclimate Study - Build

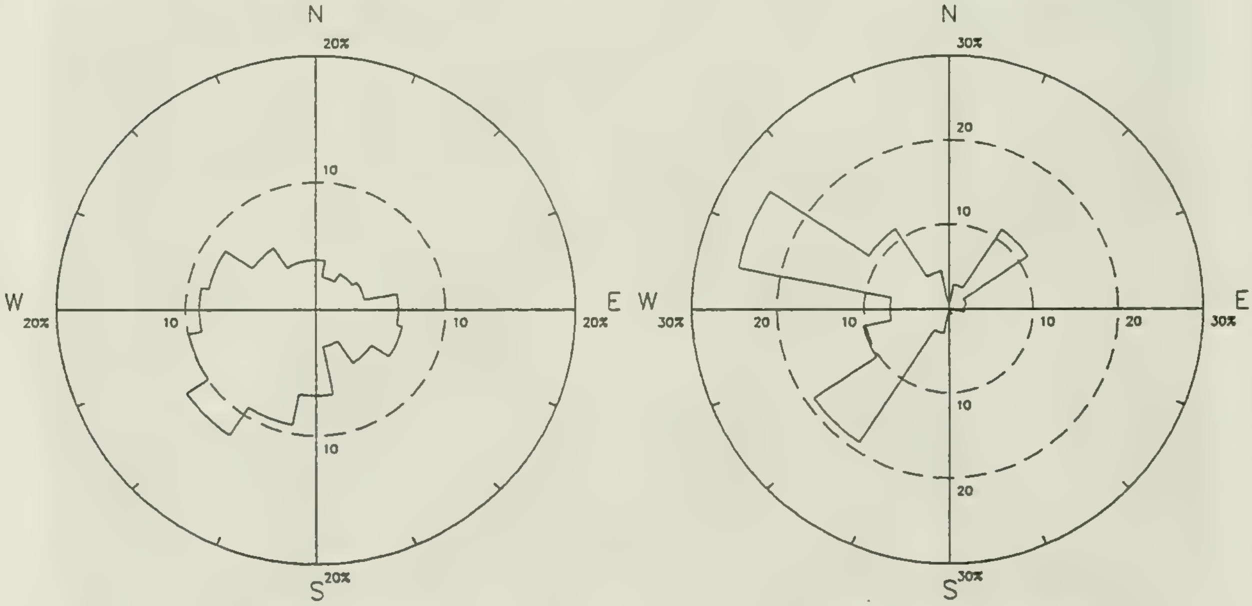
Prepared By:
Rowan Williams Davies & Irwin, Inc.

Figure 4-2



ALL SPRING WINDS

STRONG SPRING WINDS



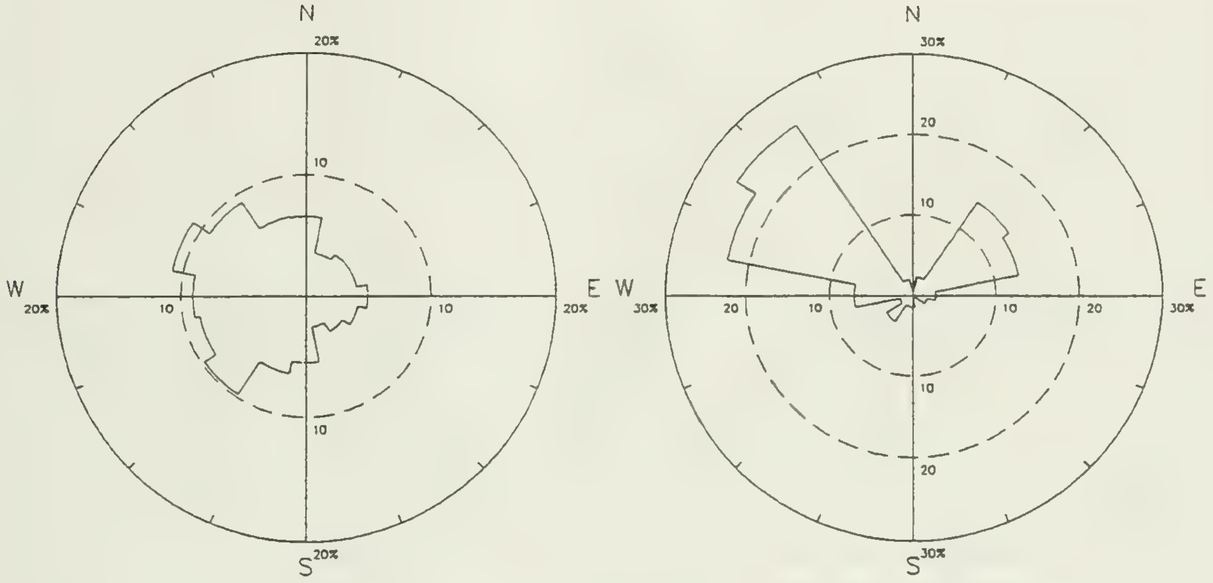
ALL SUMMER WINDS

STRONG SUMMER WINDS

Directional Distribution of Spring and Summer Winds
Logan International Airport (1945-1988)

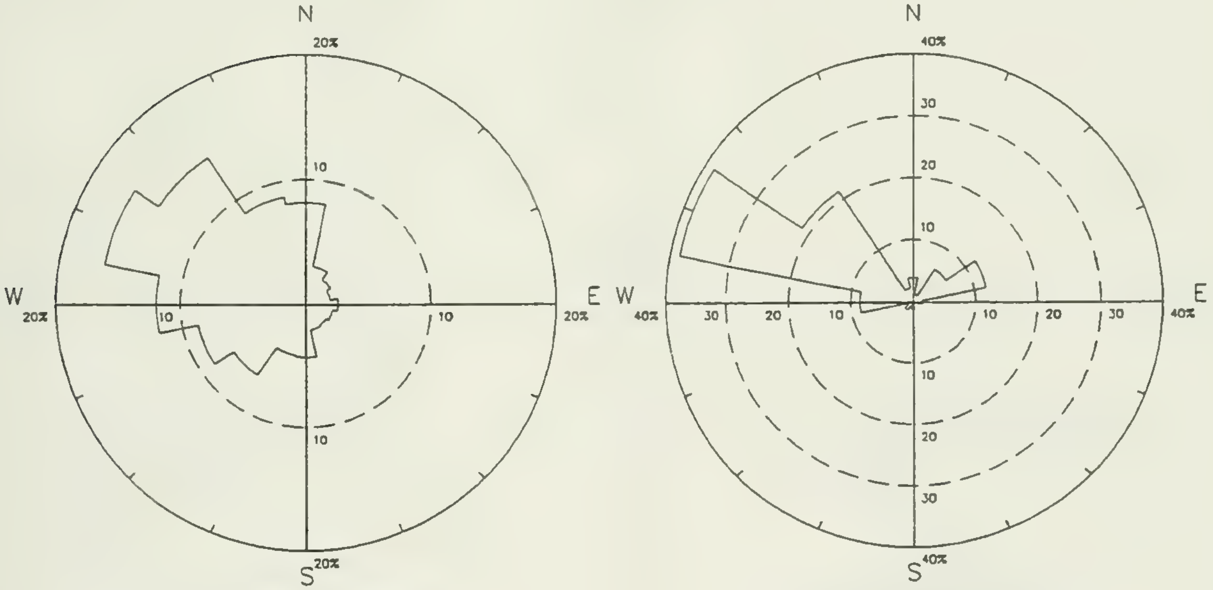
Prepared By:
Rowan Williams Davies & Irwin, Inc.

Figure 4-3



ALL FALL WINDS

STRONG FALL WINDS



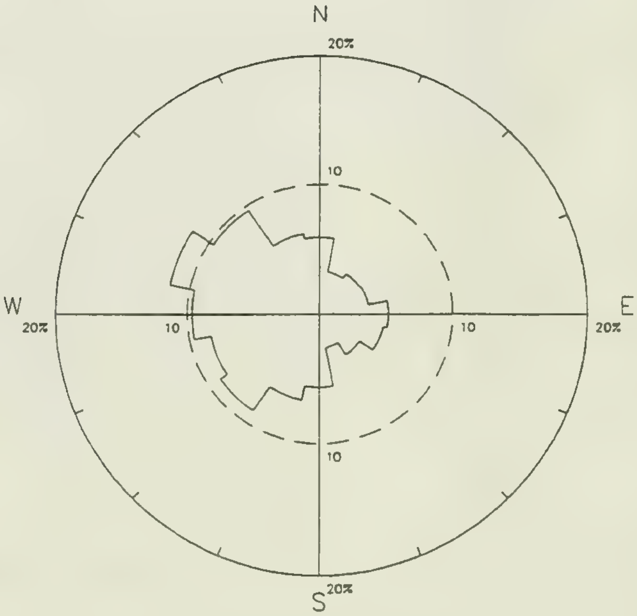
ALL WINTER WINDS

STRONG WINTER WINDS

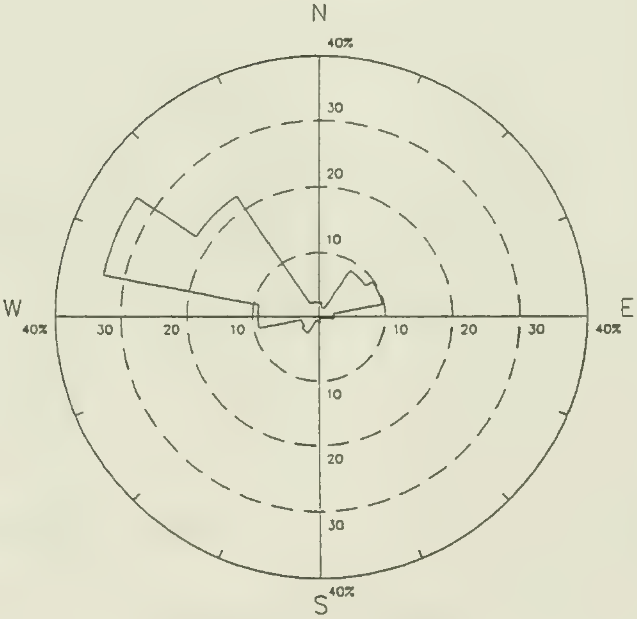
Directional Distribution of Fall and Winter Winds Logan International Airport (1945 - 1988)

Prepared By:
Rowan Williams Davies & Irwin, Inc.

Figure 4-4



ALL ANNUAL WINDS

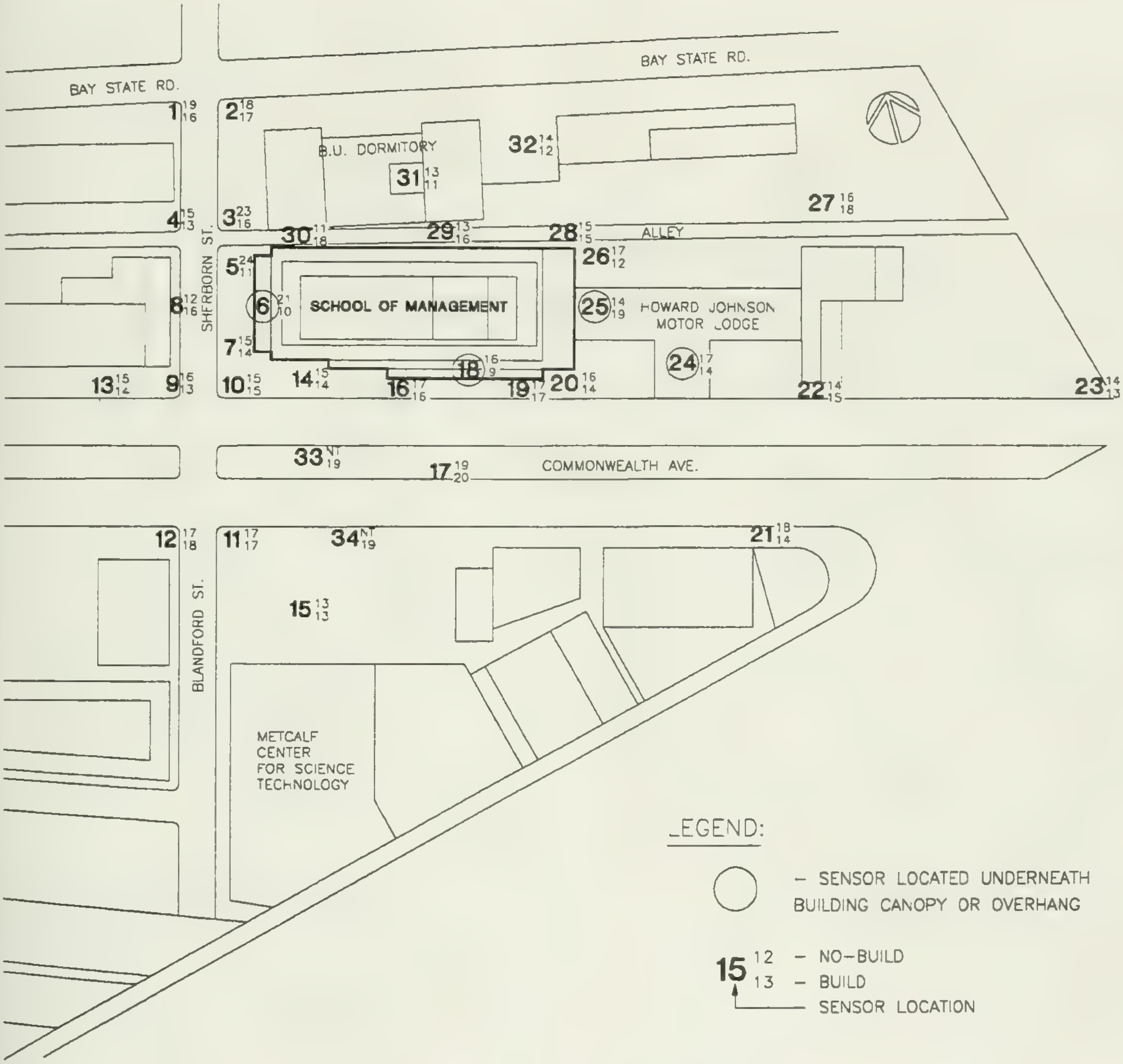


STRONG ANNUAL WINDS

Directional Distribution of Annual Winds
Logan International Airport (1945-1988)

Prepared By:
Rowan Williams Davies & Irwin, Inc.

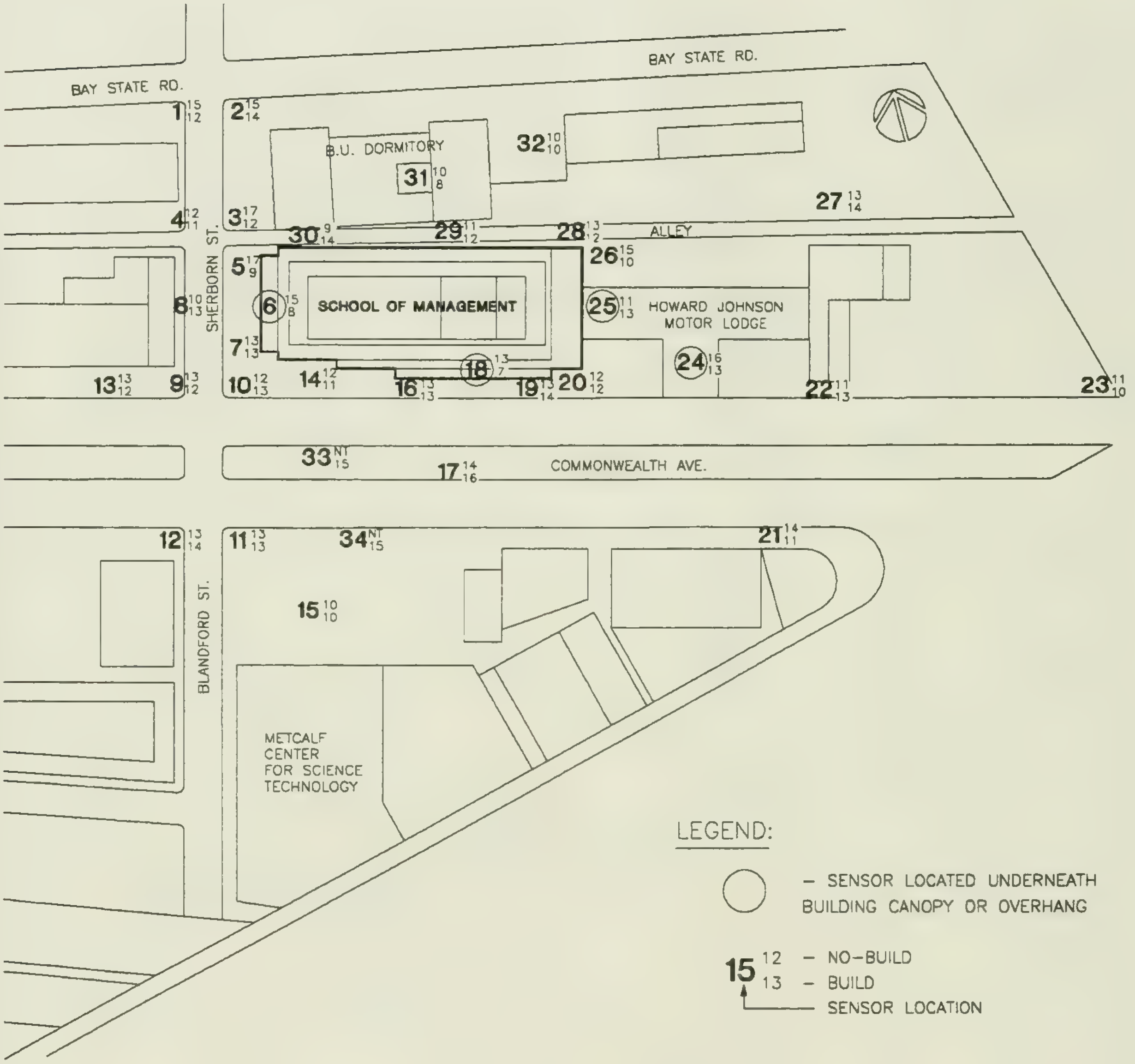
Figure 4-5



Pedestrian Level Wind Analysis
Mean Wind Speeds - Spring

Prepared By:
Rowan Williams Davies & Irwin, Inc.

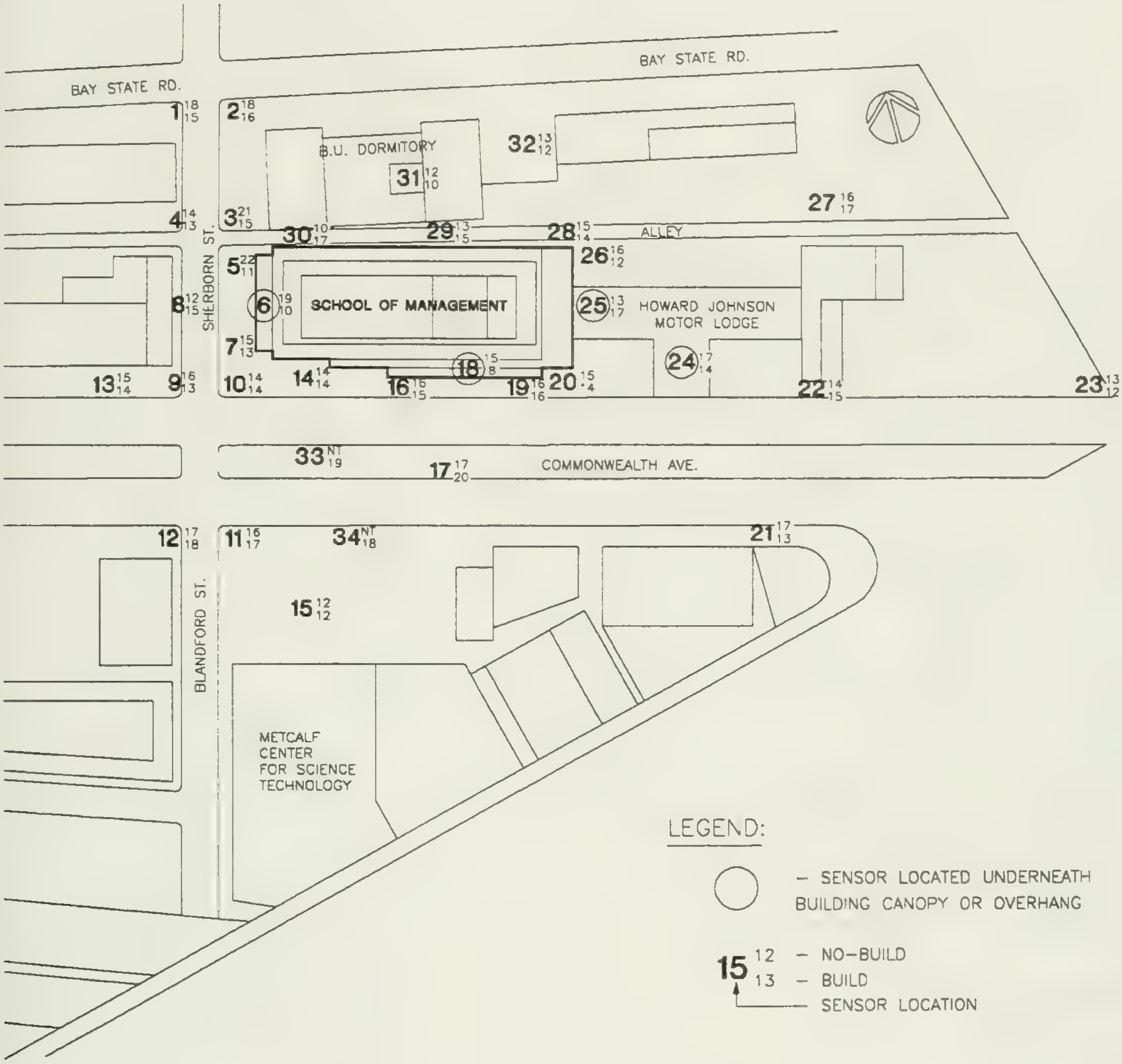
Figure 4-6



Pedestrian Level Wind Analysis
Mean Wind Speeds - Summer

Prepared By:
Rowan Williams Davies & Irwin, Inc.

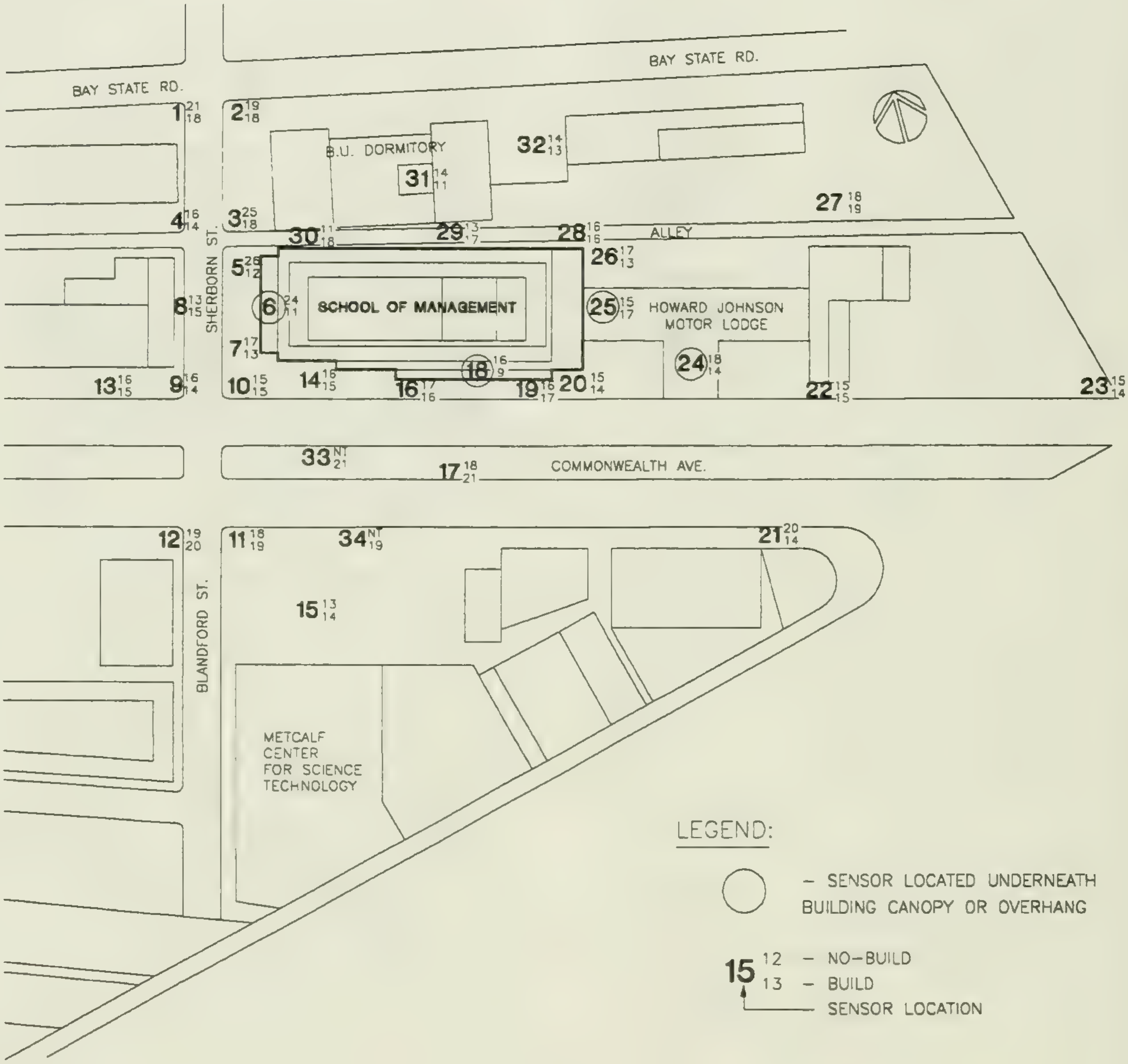
Figure 4-7



Pedestrian Level Wind Analysis
Mean Wind Speeds - Fall

Prepared By:
Rowan Williams Davies & Irwin, Inc.

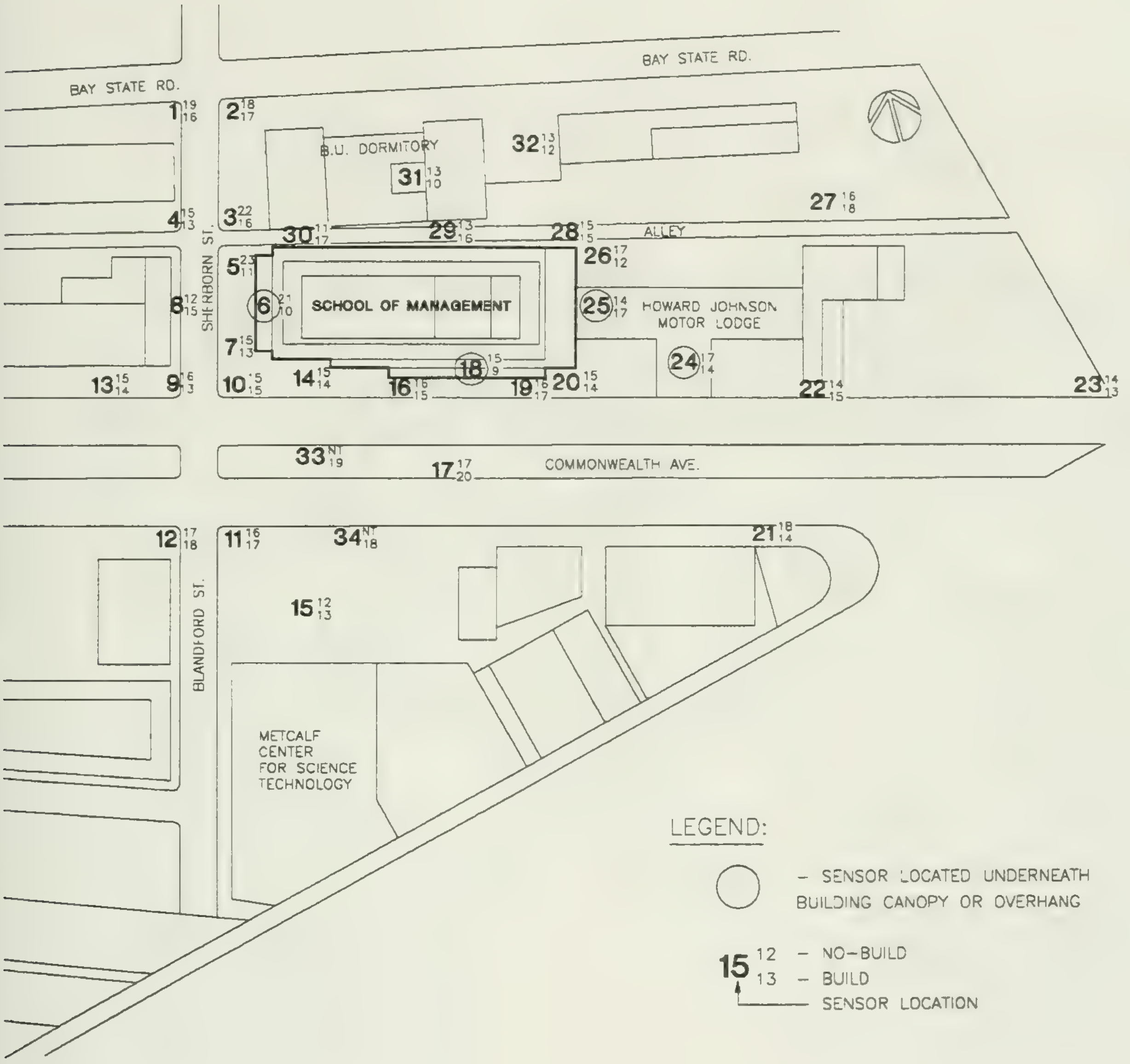
Figure 4-8



Pedestrian Level Wind Analysis
Mean Wind Speeds - Winter

Prepared By:
Rowan Williams Davies & Irwin, Inc.

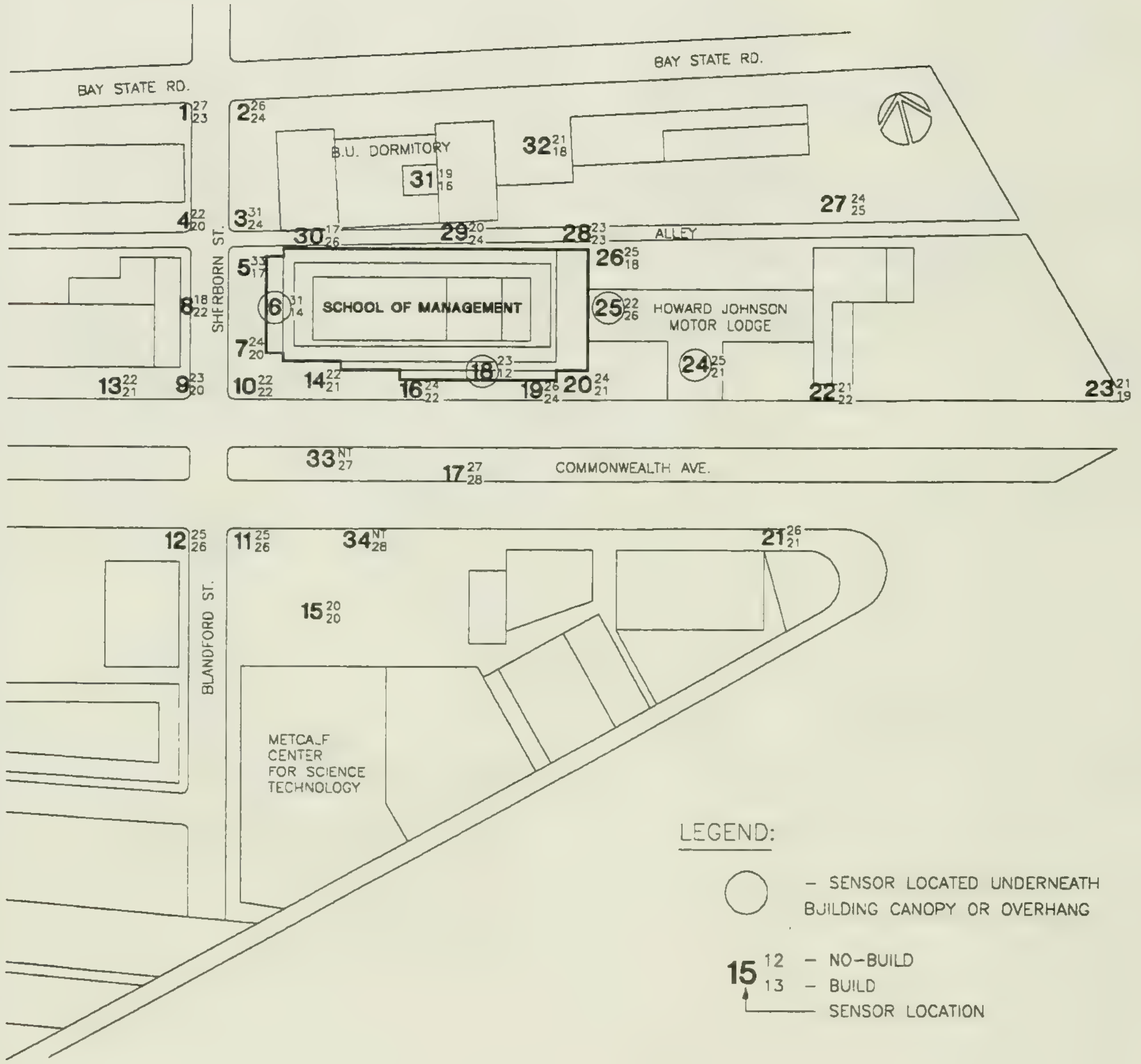
Figure 4-9



Pedestrian Level Wind Analysis
Mean Wind Speeds - Annual

Prepared By:
Rowan Williams Davies & Irwin, Inc.

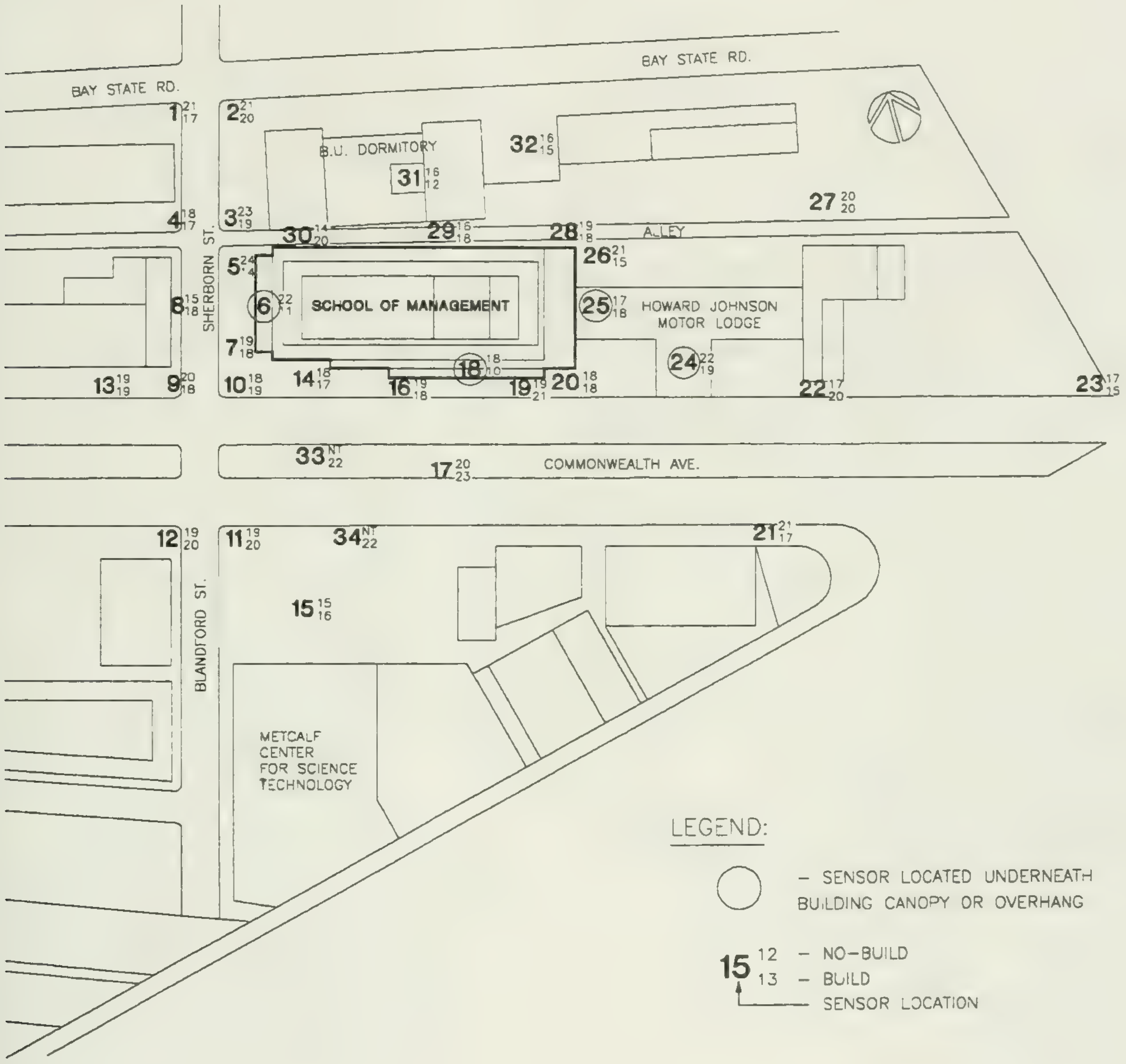
Figure 4-10



Pedestrian Level Wind Analysis
Effective Gust - Spring

Prepared By:
Rowan Williams Davies & Irwin, Inc.

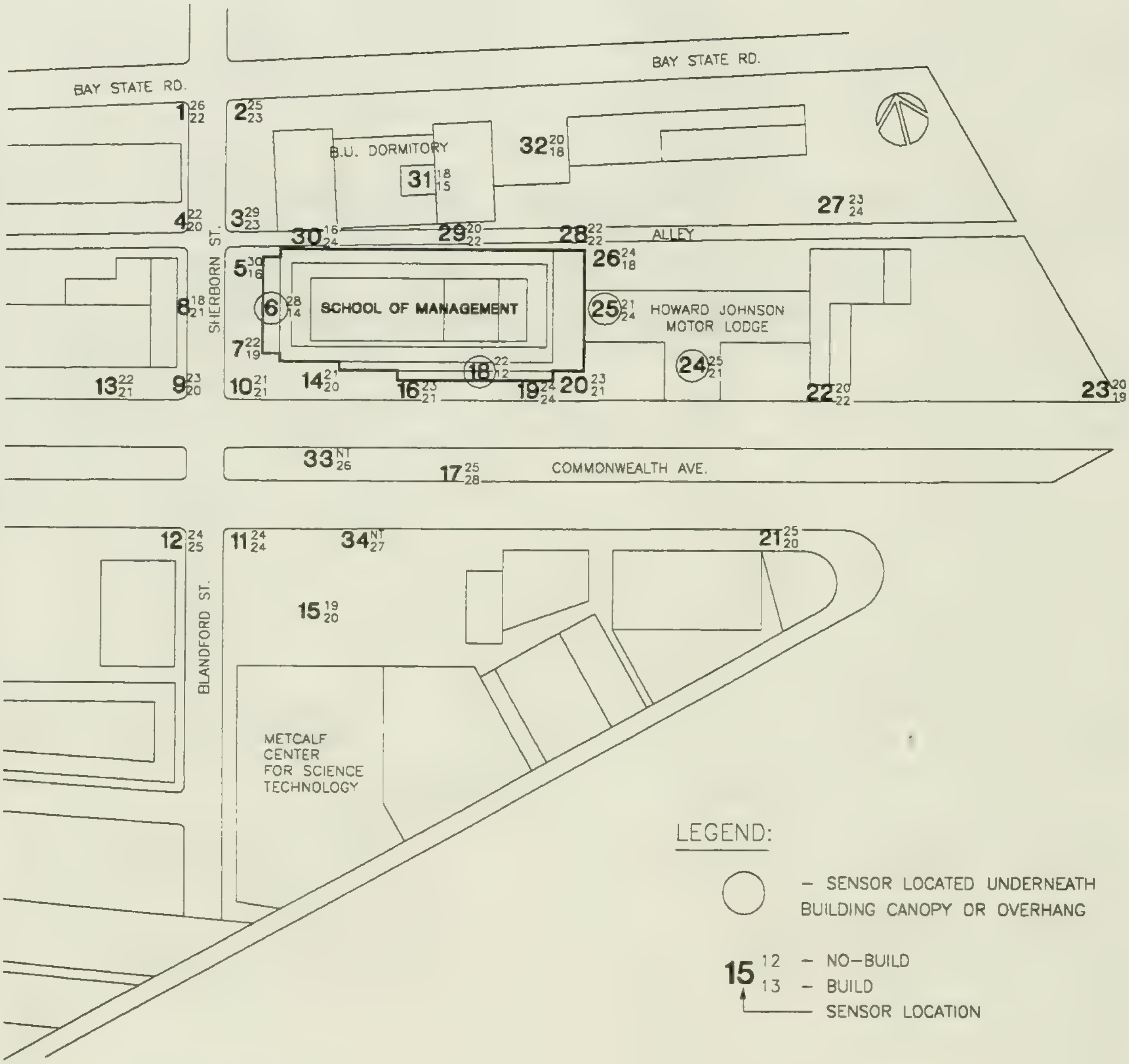
Figure 4-11



Pedestrian Level Wind Analysis
Effective Gust - Summer

Prepared By:
Rowan Williams Davies & Irwin, Inc.

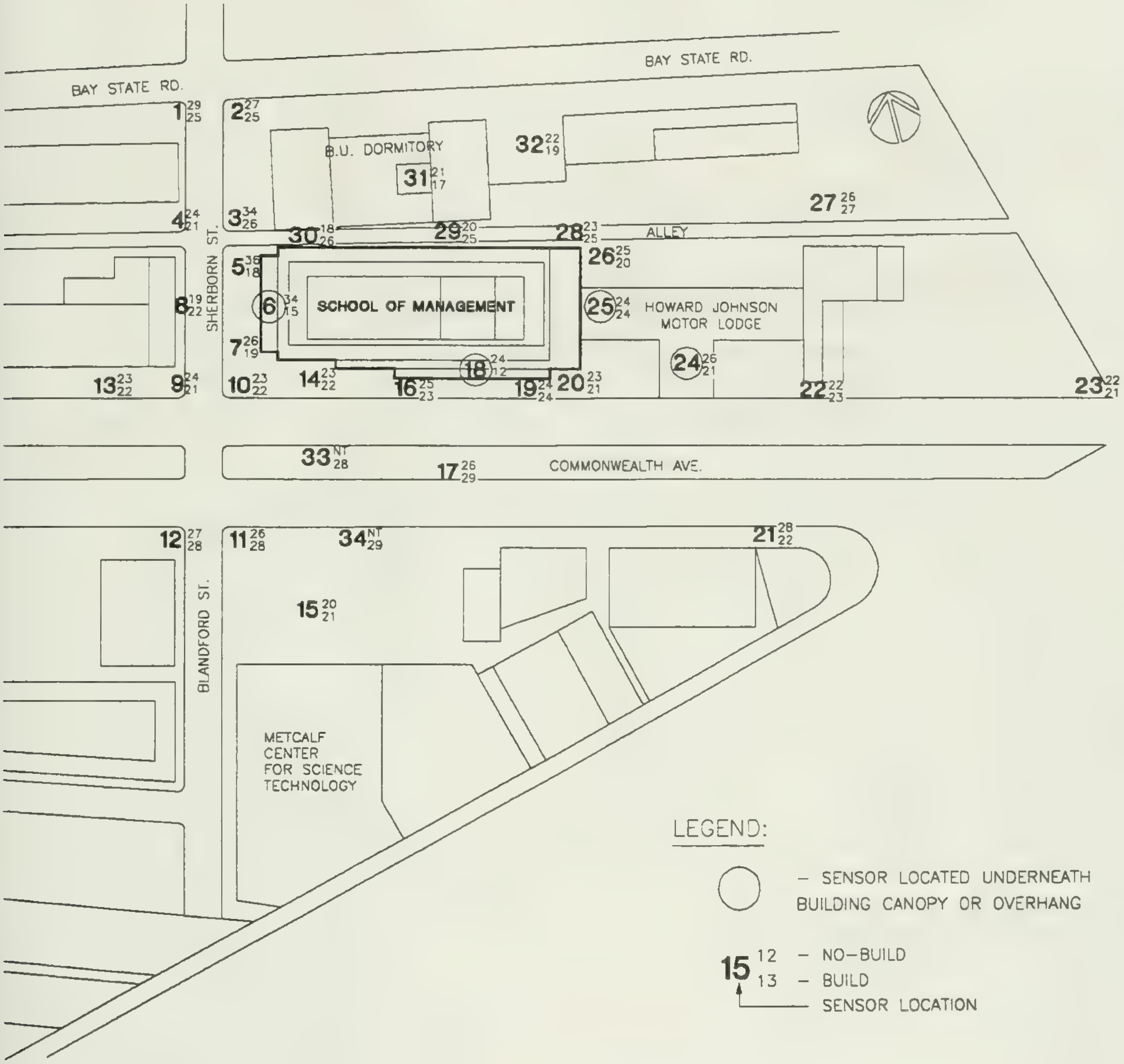
Figure 4-12



Pedestrian Level Wind Analysis
Effective Gust - Fall

Prepared By:
Rowan Williams Davies & Irwin, Inc.

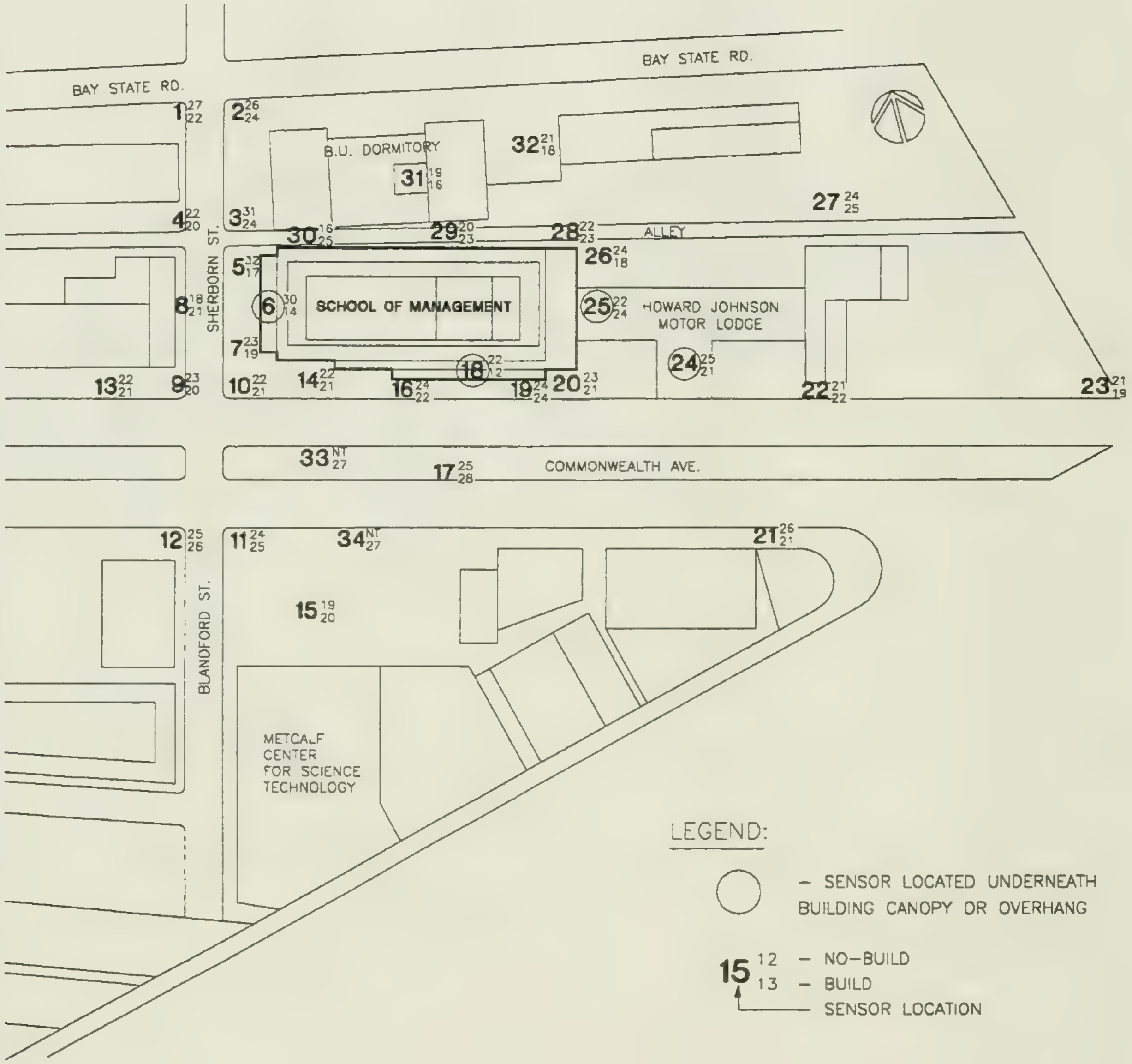
Figure 4-13



Pedestrian Level Wind Analysis
Effective Gust - Winter

Prepared By:
Rowan Williams Davies & Irwin, Inc.

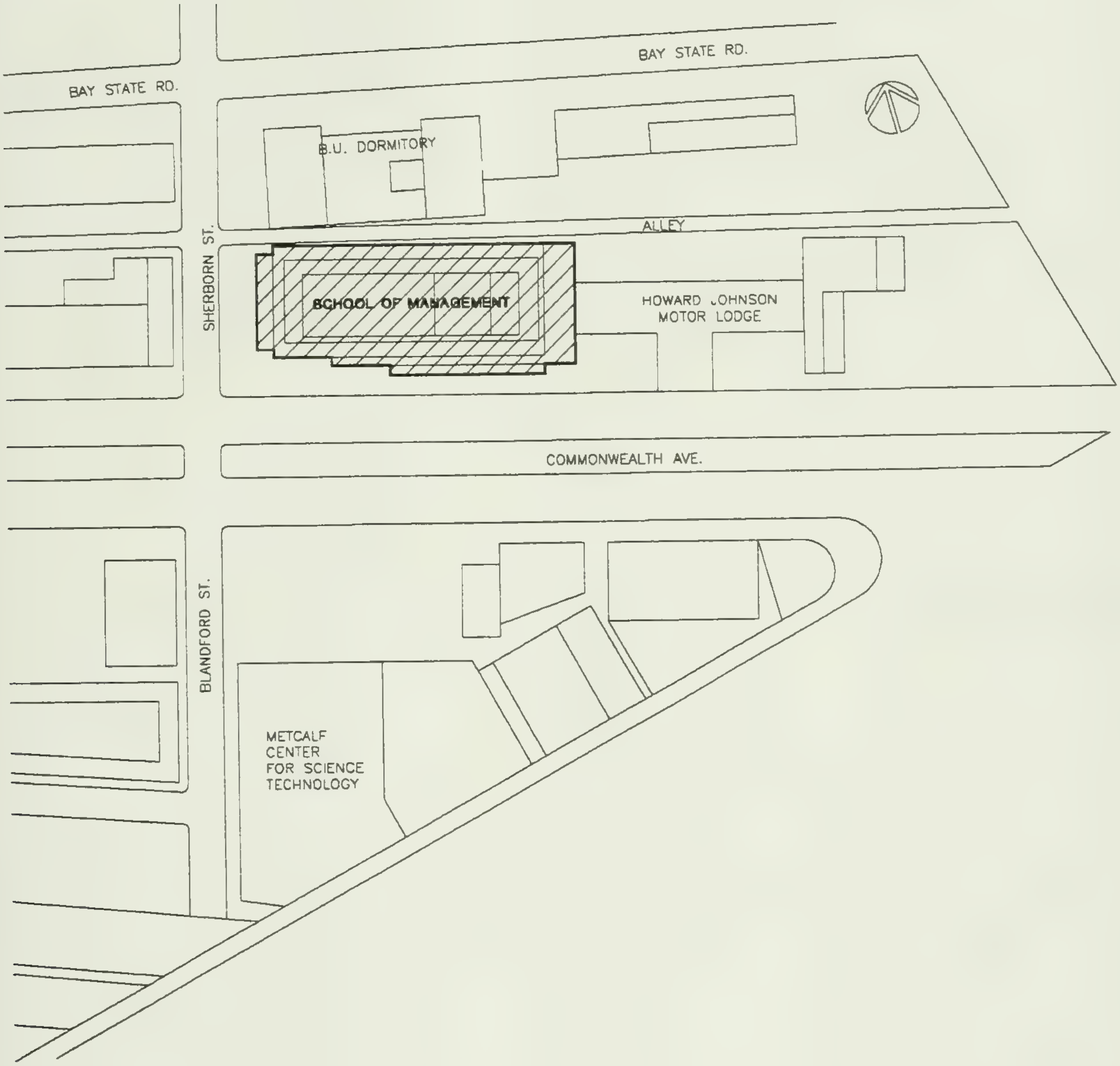
Figure 4-14



Pedestrian Level Wind Analysis
Effective Gust - Annual

Prepared By:
Rowan Williams Davies & Irwin, Inc.

Figure 4-15



Orientation Plan of Study Area

Prepared By:
Rowan Williams Davies & Irwin, Inc.

Figure 4-16

5.0 SHADOW

5.0 SHADOW

5.1 INTRODUCTION

This chapter discusses the findings of the shadow analyses for both the nine and ten story project alternatives for the new School of Management. The objective of this chapter is to describe the net impact of the shadows cast by the nine story building. This is achieved by simulating and visually illustrating the shadow conditions which would occur with and without the Project. The areas of greatest interest are public areas such as nearby sidewalks, open spaces, and historic buildings. The Project site is surrounded by University owned properties and the University owns and occupies a large majority of properties in the area affected by shadows from the Project. However, it is recognized that this is a sensitive issue near a historic district and along the Charles River.

5.2 METHODOLOGY

The shadow patterns illustrated in this report were generated with the aid of a Computer Aided Design (CAD) graphics program which utilized a scale model of the Project and its existing surroundings. The CAD model was prepared by Rowan Williams Davies & Irwin, Inc. (RWDI) based on information supplied by Cannon Architects.

A CAD-generated 3-dimensional model of the study site and surroundings was incorporated into a computer graphics program with the appropriate settings[1,2,3], to simulate the geographic characteristics and solar angles for Boston, Massachusetts.

Table 5-1 identifies the dates and times for which the shadow conditions were simulated. The dates correspond to the vernal equinox, summer solstice, autumnal equinox and the winter solstice. The times listed are Eastern Standard Time (EST) or Eastern Daylight Time (EDT), whichever is in effect for the respective dates.

---

[1] Bennet, Robert, Sun Angles for Design, Bala Cynwyd, PA, 1978.

[2] Duffet-Smith, Peter, Practical Astronomy with your Calculator, Cambridge University Press, Cambridge, Massachusetts, 1979.

[3] The Astronomical Almanac, Data for Astronomy, Space Sciences, Geodesy, Surveying, Navigation and Other Applications for the Year 1987.

Table 5-1
Dates and Times Studied

DATE	TIME
March 21 (EST)	9:00 AM, 12:00 noon, 3:00 PM.
June 21 (EDT)	9:00 AM, 12:00 noon, 3:00 PM
September 21 (EDT)	9:00 AM, 12:00 noon, 3:00 PM
December 21 (EST)	9:00 AM, 12:00 noon, 3:00 PM

Source: **RWDI**

In order to properly identify shadow patterns created by the new School of Management, the simulations conducted for this study assume bright sunlight from sunrise to sunset. Landscaping is not considered on the test configurations and the shadow patterns identified are those created by the various structural components of buildings.

The results are included in Figures 5-2 through 5-25. These figures exhibit the simulated shadow conditions anticipated to occur on and around the Project site. Shadows cast by the existing buildings are shown in gray and the shadows created by the Project in light purple-gray. Shadows cast on the Charles River are shown in green, resulting from a gray shadow on blue water.

5.3 RESULTS

Figures 5-2 through 5-25 visually identify the shadows anticipated to occur on and around the Project site for the dates and times indicated, for both the nine and ten story alternatives. Figure 5-1 is an orientation plan provided for convenience in reviewing the results.

Vernal Equinox/March 21 (Figures 5-2 through 5-7)

At 9:00 AM, additional shadow cast by the ten story alternative for the new School of Management would be limited to the private alley to the immediate north of the Project site, the intersection of the alley with Sherborn Street, and a small section of the private alley to the west of Sherborn Street. The shadow from the ten story building would only affect University-owned buildings in the immediate vicinity. The shadow of the nine story alternative will cover approximately the same area at grade level. The only noticeable differences are the reduced shadow coverage on the roofs of the Boston University dormitory and the buildings at 152 and 154 Bay State Road.

By noon, additional shadow created by the ten story alternative would be concentrated on the private alley and the Boston University dormitory immediately north of the development site. A portion of the open space to the east of the Boston University dormitory would also experience some shade from the Project. The nine story alternative will reduce the Project's impact in the area between Bay State Road and the Boston University dormitory and on the open space to the east of the dormitory.

By 3:00 PM, most of the private alley to the east of Sherborn Street will be in shade. The small open space immediately east of the Boston University dormitory will be in shade; however, the majority of the shadow on this space is cast by the Boston University dormitory itself. Additional shadow cast by the ten story alternative would reach the south sides, and roofs, of some existing structures to the east of the Boston University dormitory. The majority of the structures affected are owned and occupied by Boston University. The shadow of the nine story alternative will cover a similar area at grade level. However, there will be a reduction in the shadow coverage on Bay State Road and on the roofs of the existing row of houses to the east of the dormitory.

Bay State Road will not experience a significant increase in shadows from either the nine or ten story project alternative at this time of year given the extent of existing shadows.

Summer Solstice/June 21 (Figures 5-8 through 5-13)

During this time of year, additional shadow from the ten story alternative would touch only those portions of Sherborn Street and the private alley adjacent to the study site and some buildings in the immediate vicinity. A portion of Sherborn Street would be in shade during the morning. By noon, the only impact of the additional shadow would be on the private alley immediately to the north and a portion of the southern face of the Boston University dormitory. By 3:00 PM, Sherborn Street would be predominantly sunlit, whereas a portion of the private alley would be in shade. At this time, the only buildings with additional shadow would be the dormitory and a small portion of the Howard Johnson's Motor Lodge. The open space immediately east of the Boston University dormitory would be sunlit for most of the day. The majority of shadow reaching this open space area is cast by the existing dormitory. The nine story alternative will result in a slightly reduced area of shadow coverage on the roof of the building at 605 Commonwealth Avenue at 9:00 AM, and allow sunlight to reach the sidewalk on the east side of Sherborn Street at 12:00 noon. This alternative will slightly reduce the area of shadow coverage on the north side of the alley and on the open space east of the dormitory.

Autumnal Equinox/September 21 (Figures 5-14 through 5-19)

The shadow conditions during the Autumnal Equinox will be similar to those described for the Vernal Equinox. During the morning, additional shadow cast by the ten story building would cover the portion of the private alley immediately north of the study site, the intersection of the private alley and Sherborn Street, and a portion of the alley to the west of Sherborn Street. The south facade of some of the buildings along the private alley west of Sherborn Street and south of Bay State Road (owned by the University and others), would be affected by existing and additional shadows. The shadow from the nine story alternative will be less. It will extend west along the private alley to 168 Bay State Road and cover a small portion of the roofs of the Boston University dormitory, 605 Commonwealth Avenue, 152 and 154 Bay State Road.

By noon, additional shadow from the ten story alternative would cover a portion of the private alley immediately north of the study site and a portion of the open space to the east of the Boston University dormitory. The shadow from the nine story alternative will be similar except there will be slightly reduced coverage along Sherborn Street and on the dormitory roof.

By 3:00 PM, additional shadow from the ten story alternative would reach the roof and south face of some buildings east of the open space and south of Bay State Road. This shadow would have an insignificant impact on Bay State Road itself and the areas farther north. With respect to the open space east of the Boston University dormitory, there would be a combined shadow impact created by the existing Boston University dormitory and the ten story alternative. The shadow from the nine story alternative will not extend to Bay State Road and will cover a smaller area of the roofs and grounds of the buildings to the east of the dormitory.

Winter Solstice/December 21 (Figures 5-20 through 5-25)

The longest shadows of the year occur during the winter solstice when the sun is very low on the horizon. At 9:00 AM, the shadow from the ten story building would just reach the southern-most portion of the south bank of the Charles River. However, most of the intervening streets will already be in shadow cast by existing structures. The largest net increase in shading would occur at the intersection of Sherborn Street and the private alley which runs along the north side of the Project site, and the southern portion of the Charles River. The roofs of the intervening buildings would also be in shade. There would be some additional shadow along Storrow Drive; however, this would only be a slight increase to the existing shadows affecting this area.

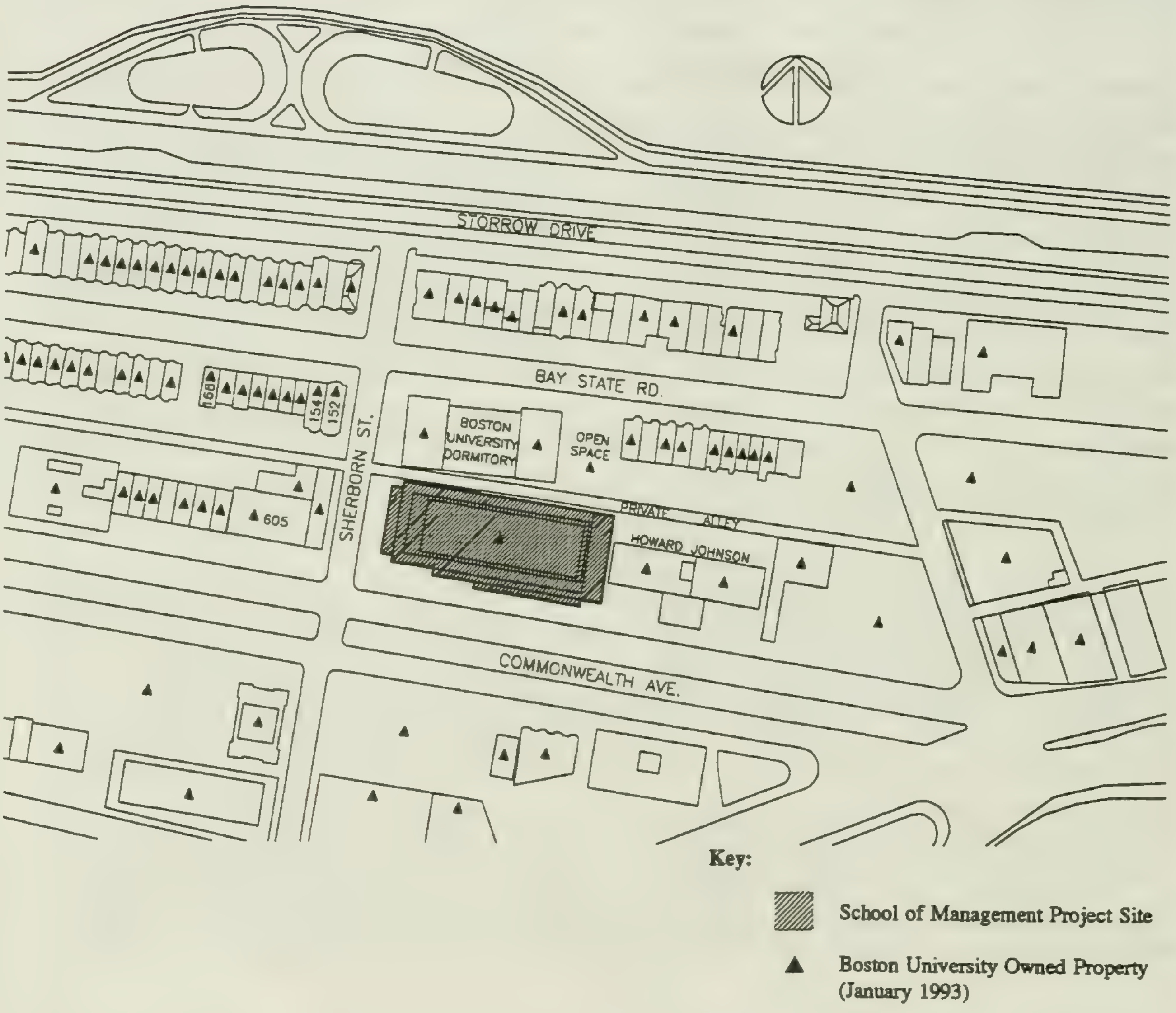
At 9:00 AM, the nine story alternative will create a smaller infill shadow between Storrow Drive and the southern edge of the south bank of the Charles River. This allows more opportunity for light on this public area than the ten story building. Furthermore, shadows from the nine story alternative will cover slightly less area on the east roof of the Boston University dormitory and the buildings between Bay State Road and Storrow Drive.

At noon, the ten story alternative would cast additional shadow on the alley, open space area, and Bay State Road immediately north of the development site. As noted earlier, the majority of Bay State Road is already in shadow cast by existing buildings. By 3:00 PM, which is approaching sunset for this time of year, the shadow cast by the ten story building would extend northeast onto the river as do shadows from many existing buildings. There would be some additional shadow cast on the roof tops of buildings to the northeast of the new development and in the open space to the east of the Boston University dormitory. At noon, the nine story alternative will shade approximately the same amount at grade as the ten story alternative. However, its shadow will cover fewer and smaller portions of rooftops on the buildings to the east of Sherborn Street between Bay State Road and Storrow Drive. At 3:00 PM, the nine story building will allow a larger band of sunlight to appear between Storrow Drive and the south bank of the River than with the ten story alternative.

5.4 CONCLUSION

In general, net new shadows cast by both the nine and ten story alternatives of the new School of Management project will have some effect on the immediately surrounding streets, buildings and public areas. The nine story project will have a lesser impact than the ten story alternative on Bay State Road and the south bank of the Charles River. In the morning, the shaded areas typically consist of the private alley north of the study site, the intersection of Sherborn Street and the alley, and the south side of some of the buildings to the northwest of the study site along the alley. In the afternoon, the shaded areas typically consist of portions of the alley to the east of Sherborn Street, the open space to the east of the Boston University dormitory and some of the backs of buildings on Bay State Road. Except for the winter solstice, the greatest impact of shadows from the Project is limited to these areas. Bay State Road will receive some additional shadow on the south side at 3:00 PM during March and September. This shadow primarily affects the backs of roofs and buildings on the south side of Bay State Road. The shadow does not impact the front facades of buildings on either side of Bay State Road.

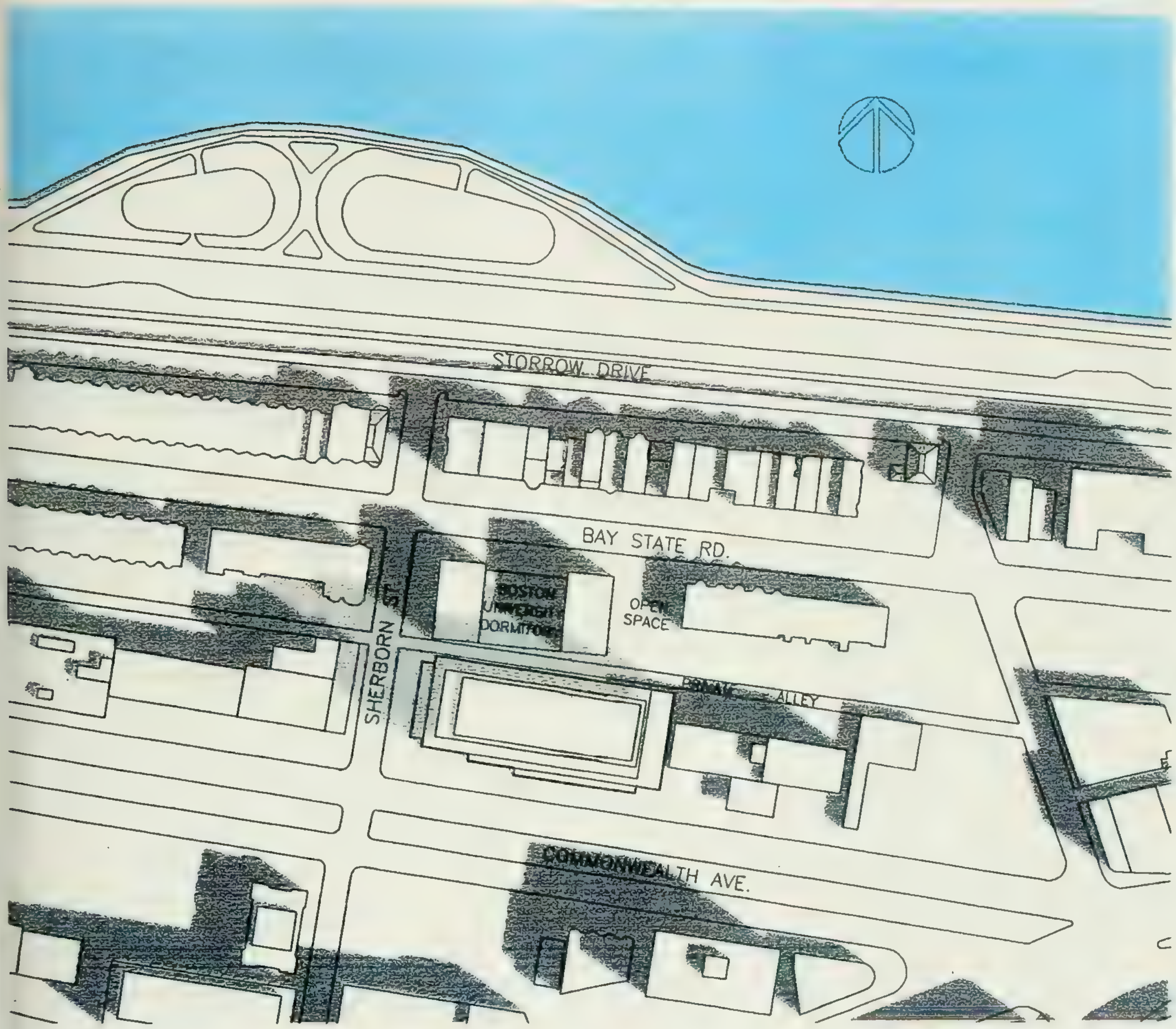
During the winter solstice, the greatest shadow lengths will occur. Shadows from the new School of Management will reach areas summarized above and extend beyond to reach the southern portion of the river bank in the morning and the river in the afternoon. It should be noted, however, that the majority of the grade level areas between the Project site and the river are already in shadow cast by existing buildings. The most significant increase in shadow during the winter through mid-day and on the river in the afternoon will occur on portions of the alley, along Bay State Road immediately north of the study site, and the open space east of the Boston University dormitory. The large majority of the buildings are owned and occupied by the University. It should be noted that morning winter use of the river bank and other public spaces is low in the winter months and use of the river itself is almost non-existent. The additional shadow on Bay State Road is consistent with existing shadows along the rest of the street.


STORROW DRIVE
BAY STATE RD.
SHERBORN ST.
168
154
152
605
BOSTON UNIVERSITY DORMITORY
OPEN SPACE
PRIVATE ALLEY
HOWARD JOHNSON
COMMONWEALTH AVE.
Key:
▨ School of Management Project Site
▲ Boston University Owned Property (January 1993)

Orientation Plan

Prepared By:
Rowan Williams Davies & Irwin Inc.

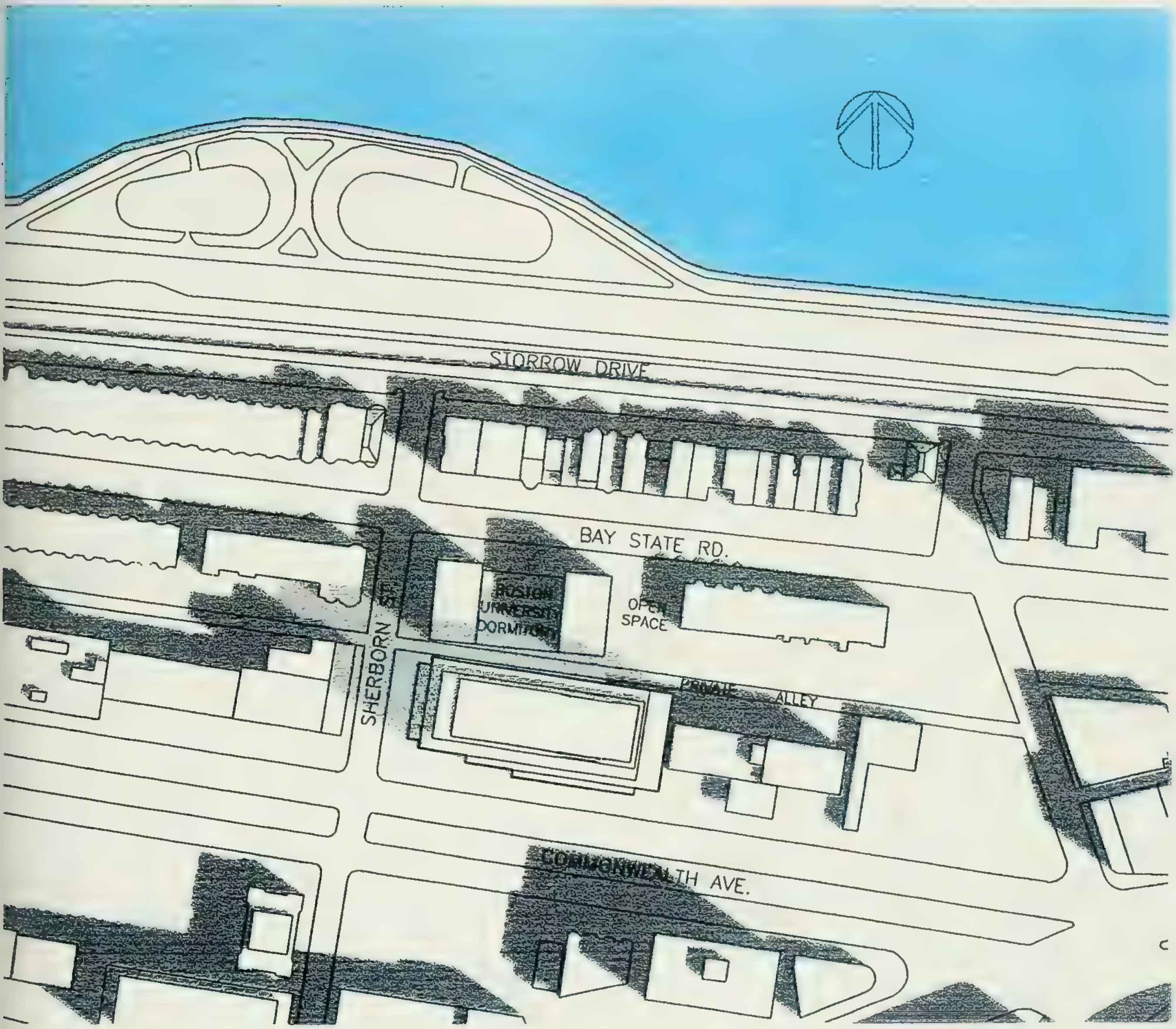
Figure 5-1



Shadow March 21, 9:00 AM (10 Story)

Prepared By:
Rowan Williams Davies & Irwin Inc.

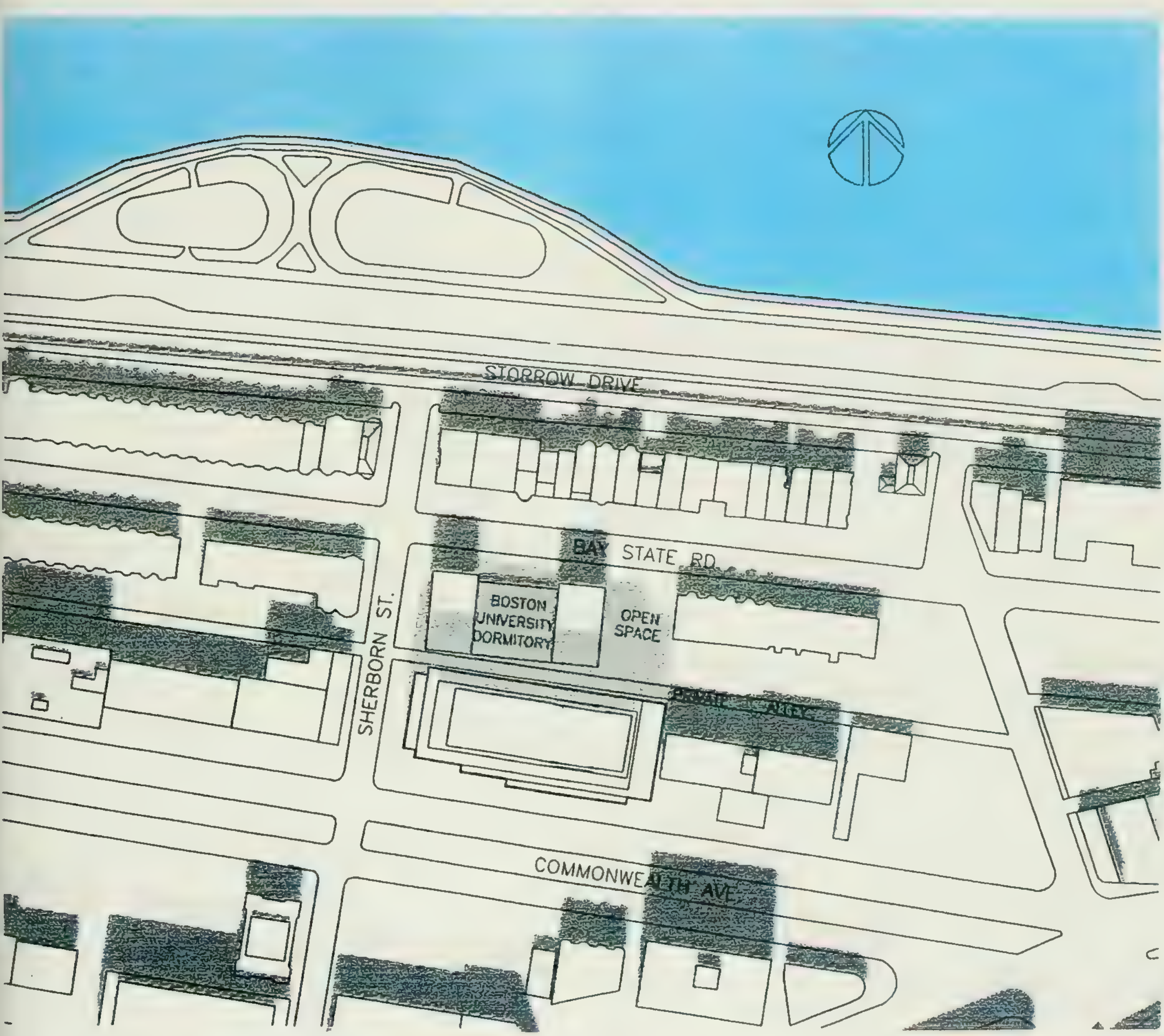
Figure 5-2



Shadow March 21, 9:00 AM (9 Story)

Prepared By:
Rowan Williams Davies & Irwin Inc.

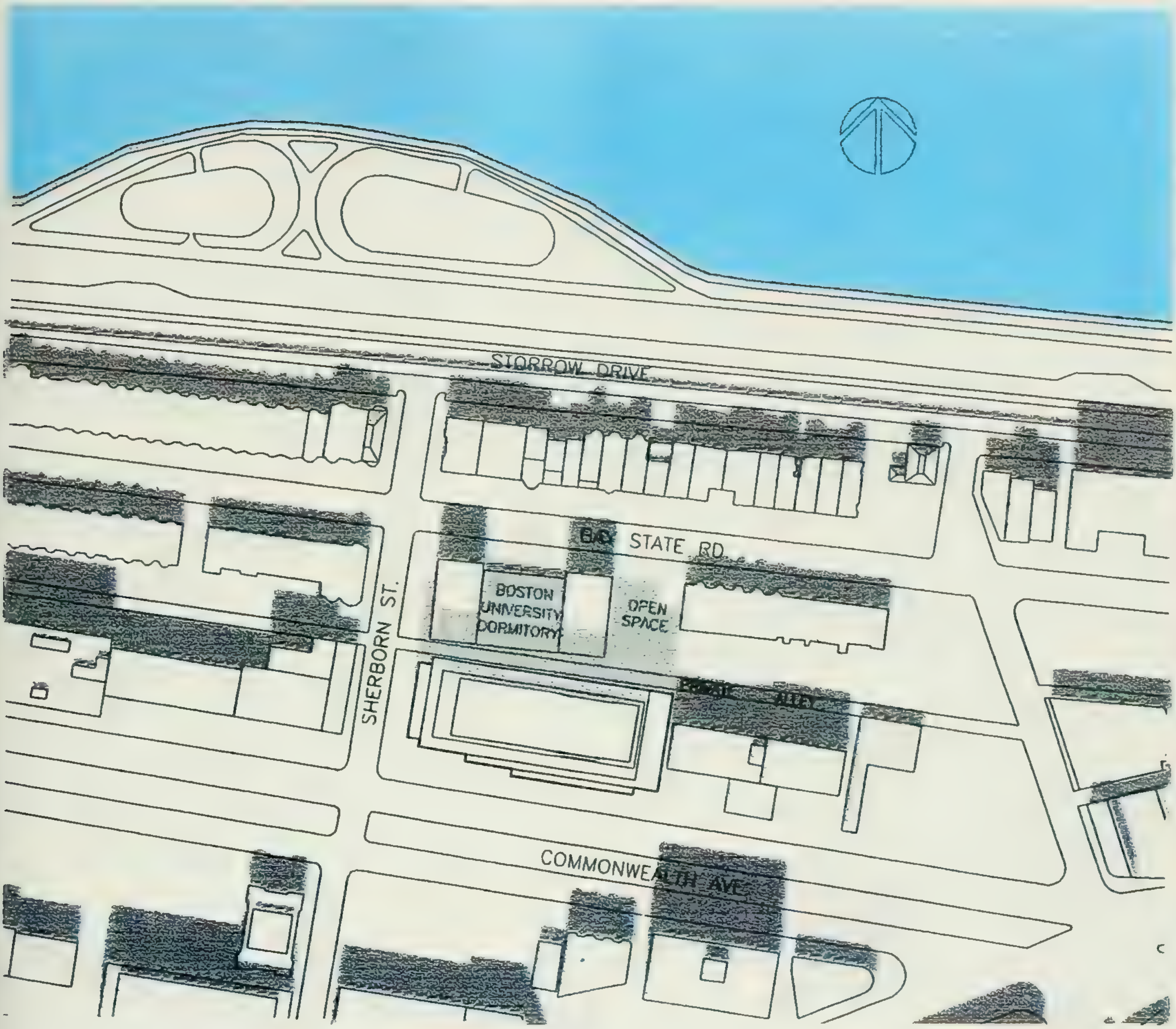
Figure 5-3



Shadow March 21, Noon (10 Story)

Prepared By:
Rowan Williams Davies & Irwin Inc.

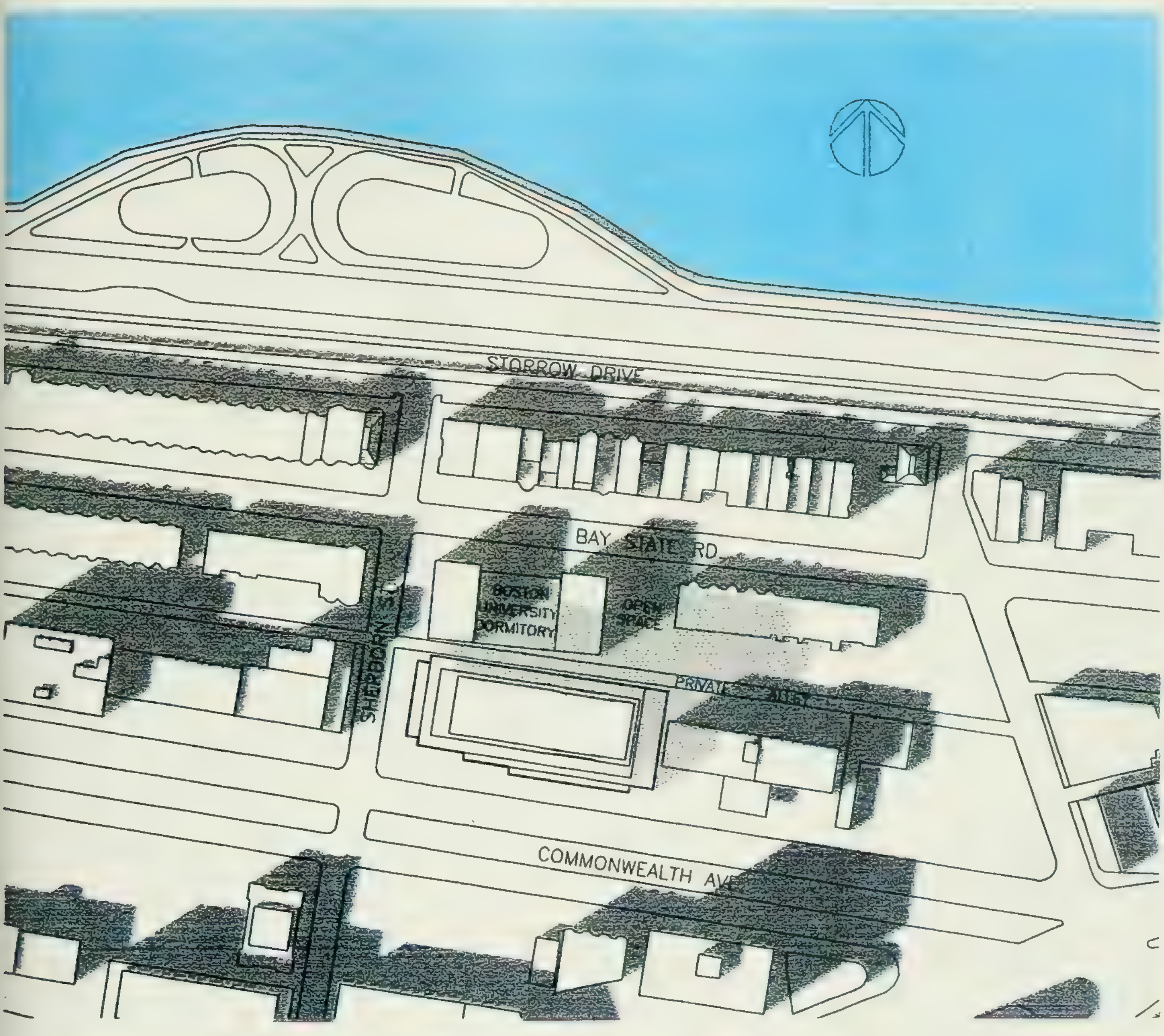
Figure 5-4



Shadow March 21, Noon (9 Story)

Prepared By:
Rowan Williams Davies & Irwin Inc.

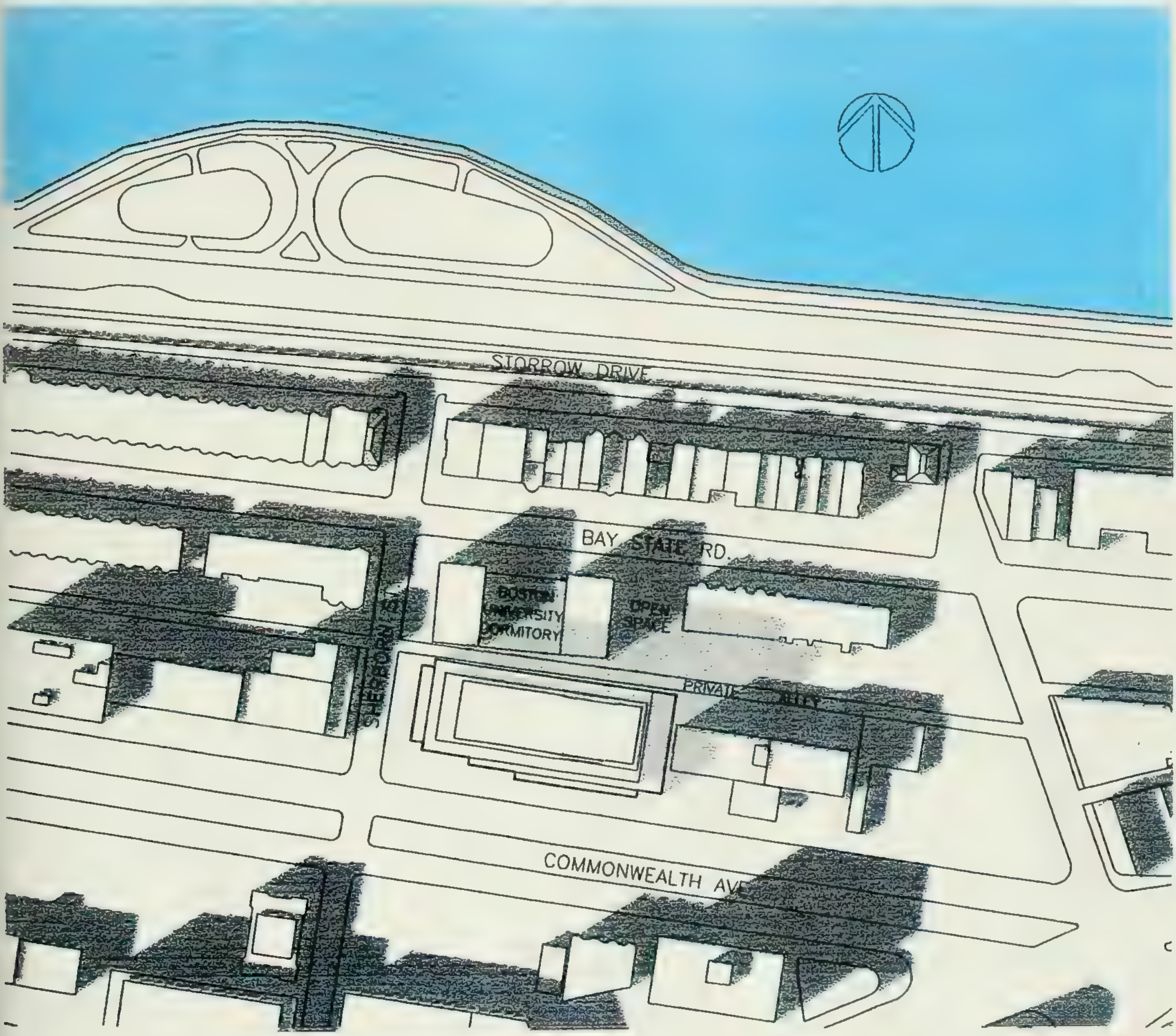
Figure 5-5



Shadow March 21, 3:00 PM (10 Story)

Prepared By:
Rowan Williams Davies & Irwin Inc.

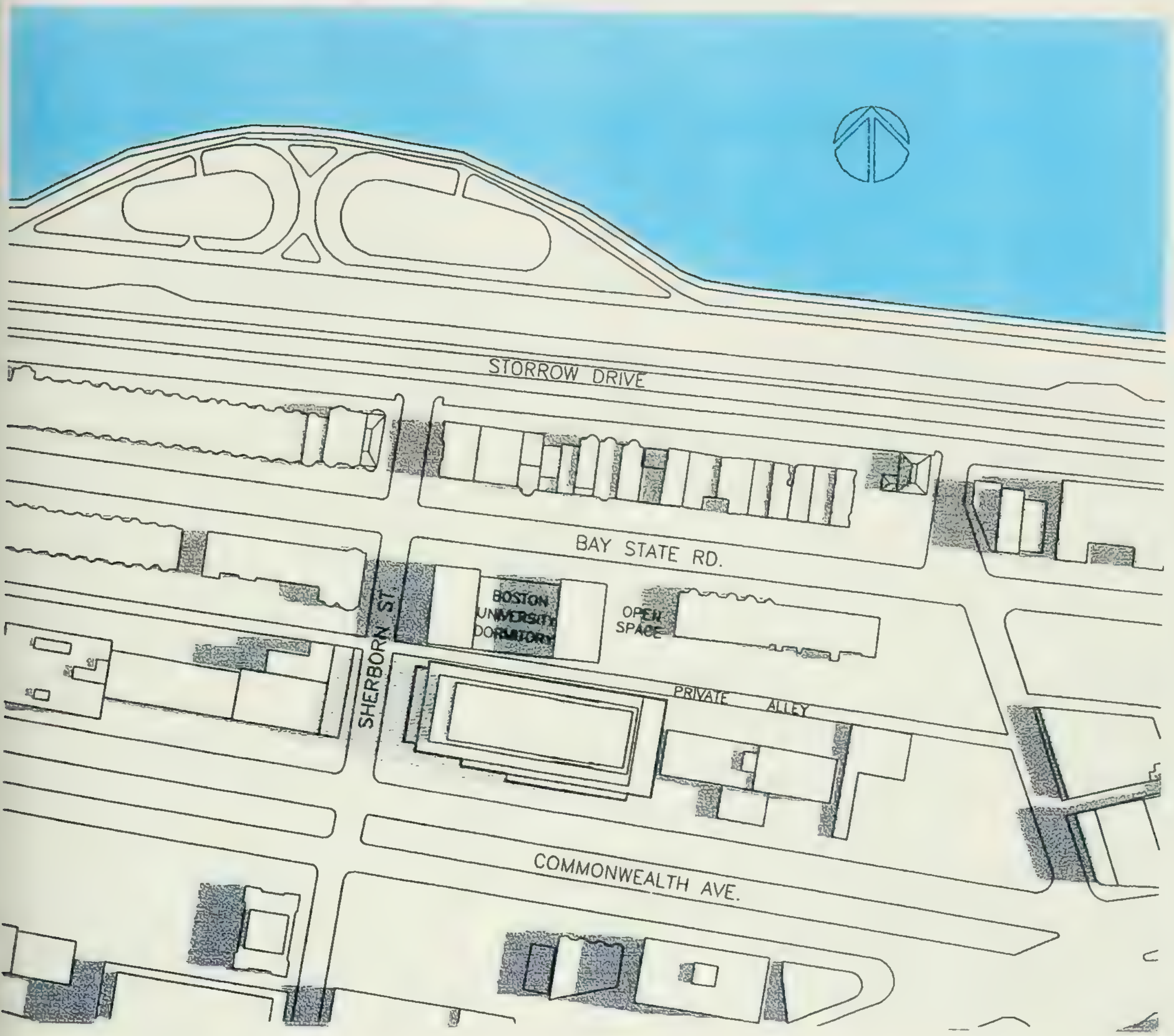
Figure 5-6



Shadow March 21, 3:00 PM (9 Story)

Prepared By:
Rowan Williams Davies & Irwin Inc.

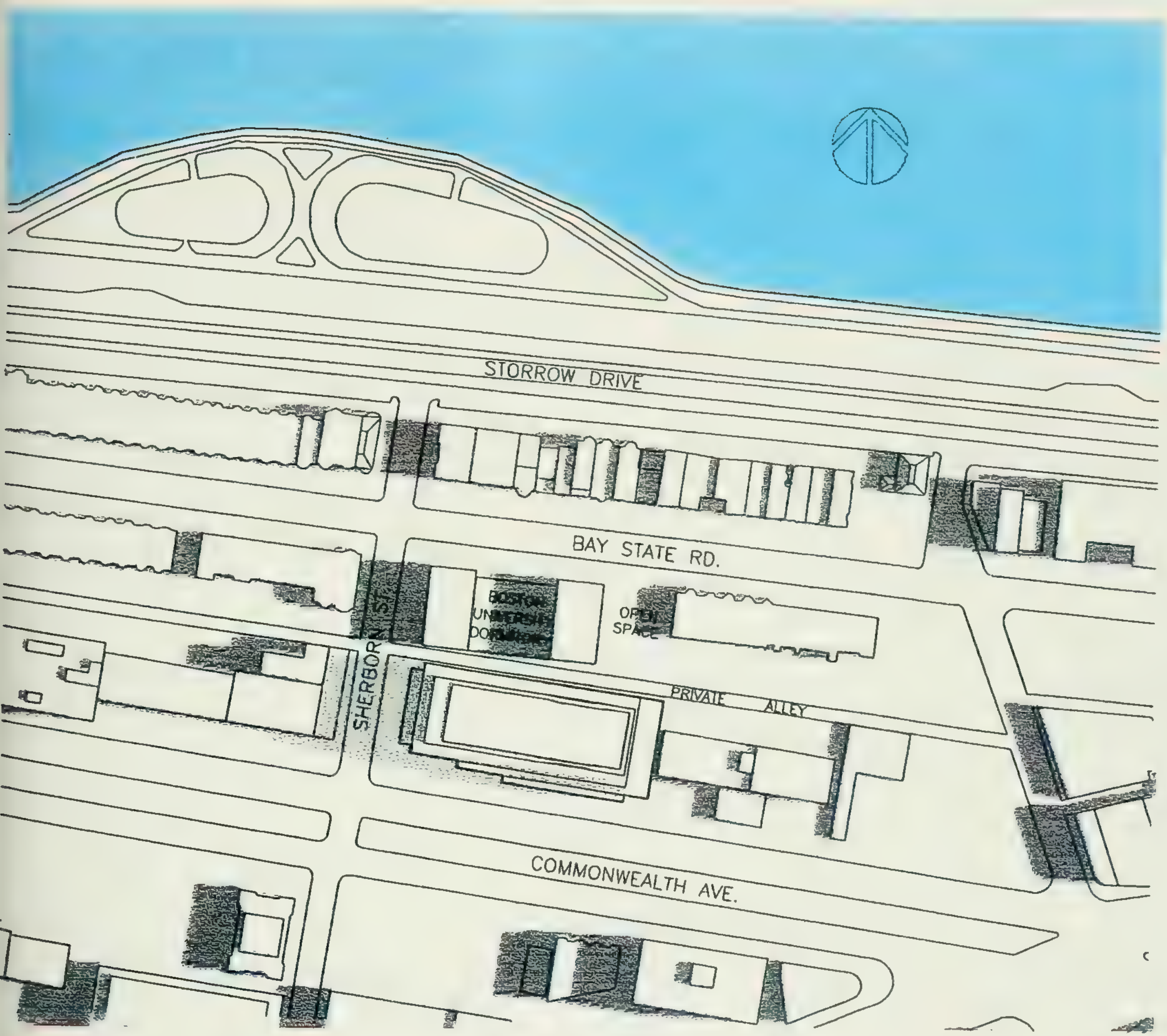
Figure 5-7



Shadow June 21, 9:00 AM (10 Story)

Prepared By:
Rowan Williams Davies & Irwin Inc.

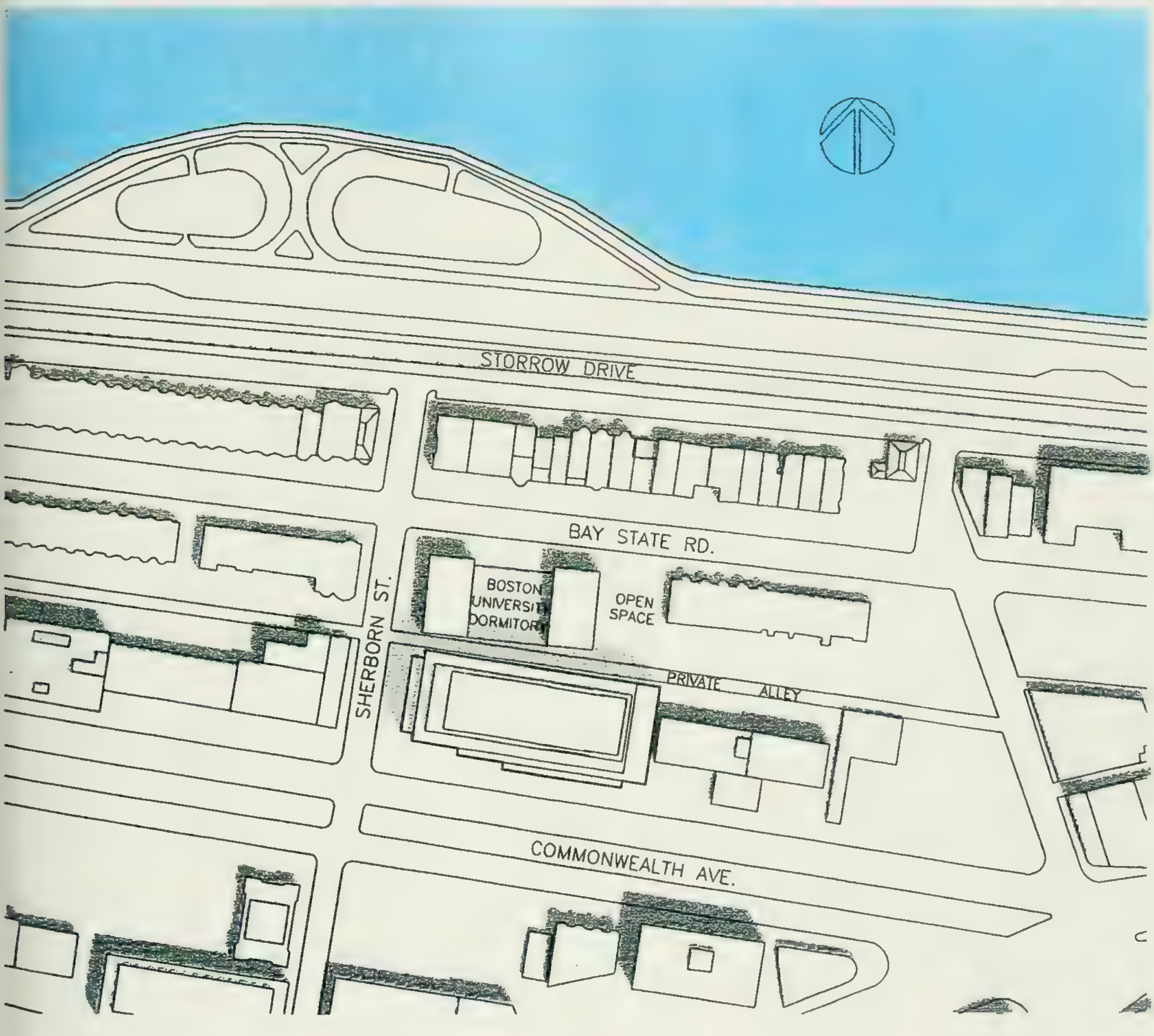
Figure 5-8



Shadow June 21, 9:00 AM (9 Story)

Prepared By:
Rowan Williams Davies & Irwin Inc.

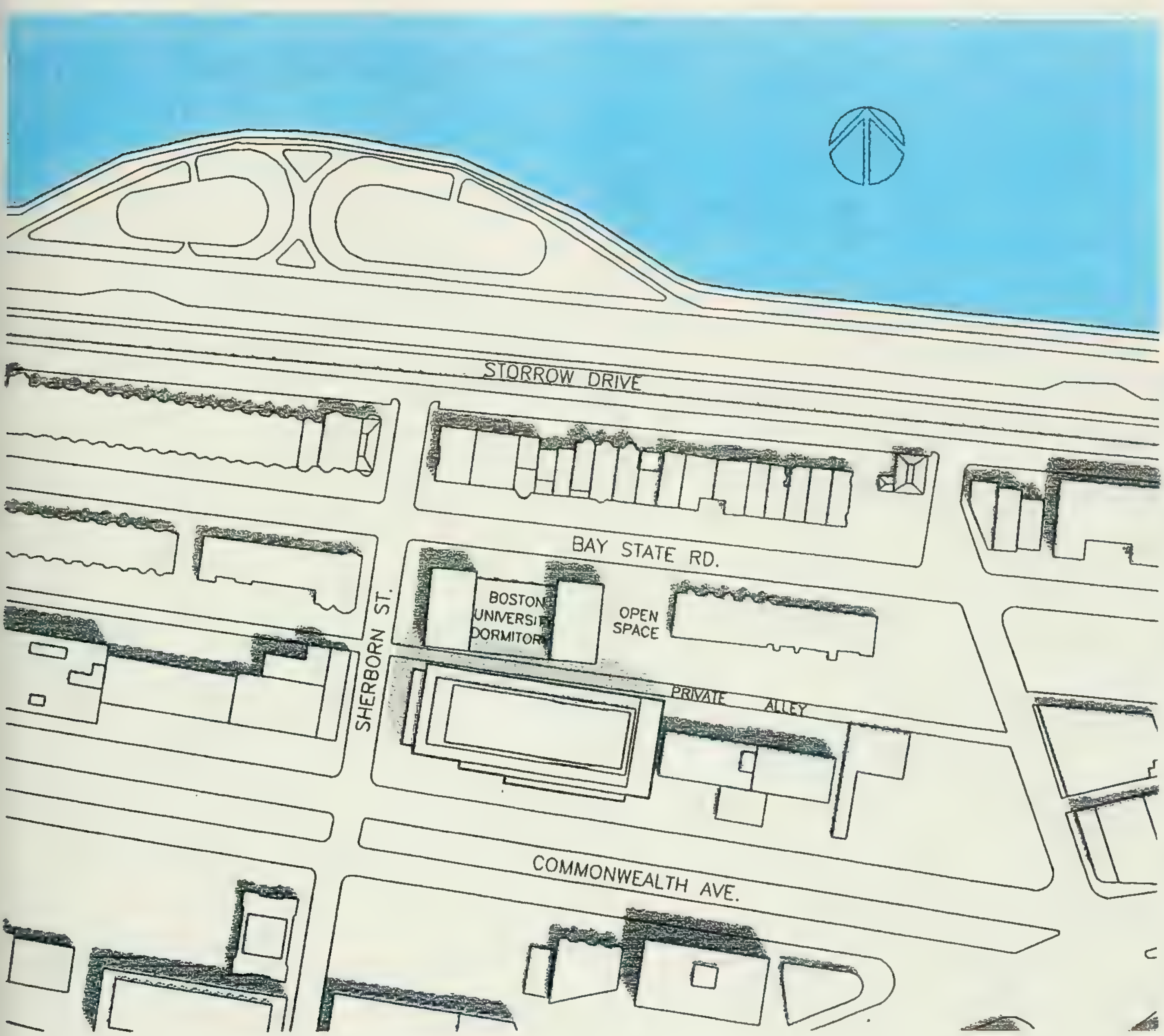
Figure 5-9



Shadow June 21, Noon (10 Story)

Prepared By:
Rowan Williams Davies & Irwin Inc.

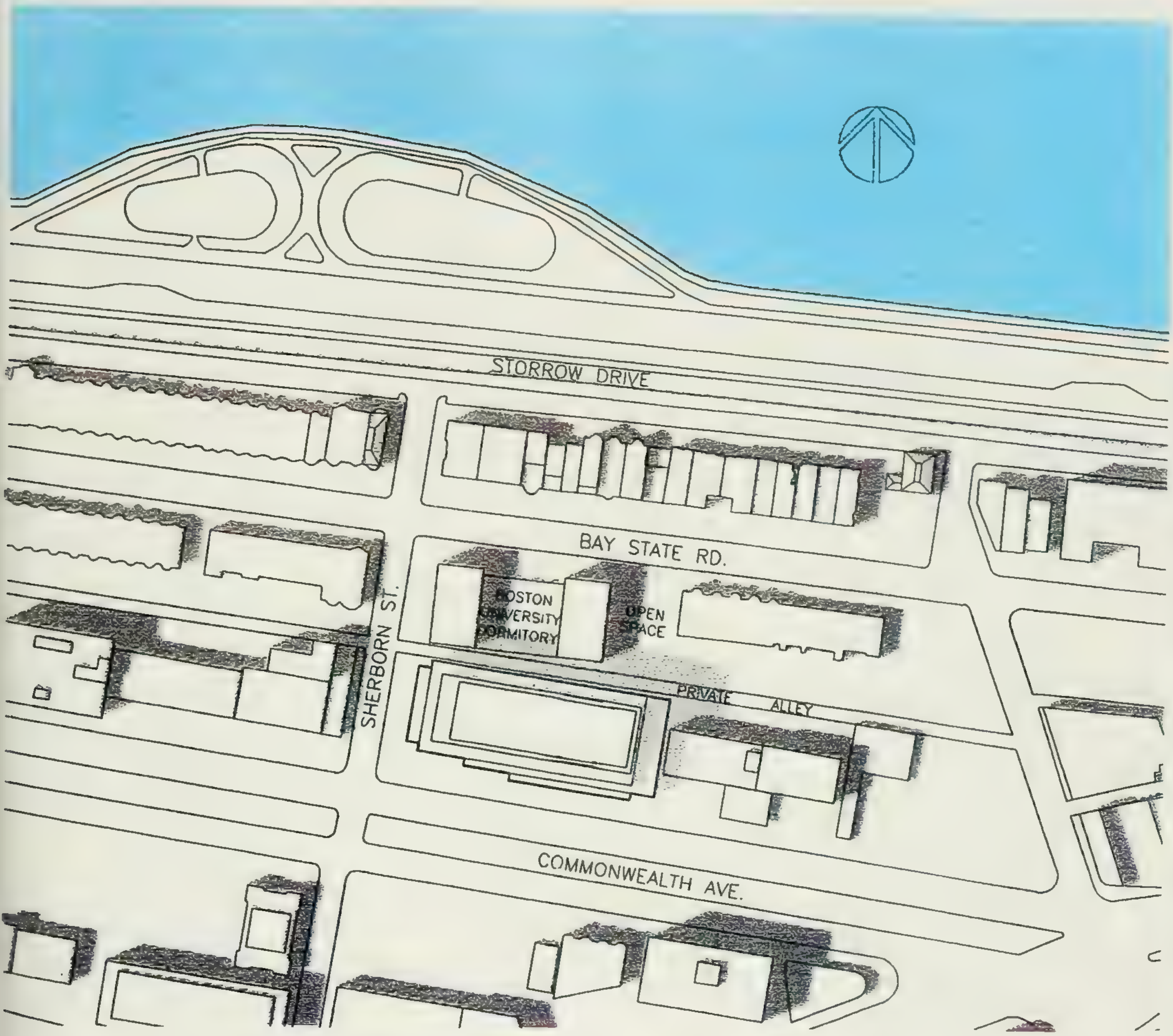
Figure 5-10



Shadow June 21, Noon (9 Story)

Prepared By:
Rowan Williams Davies & Irwin Inc.

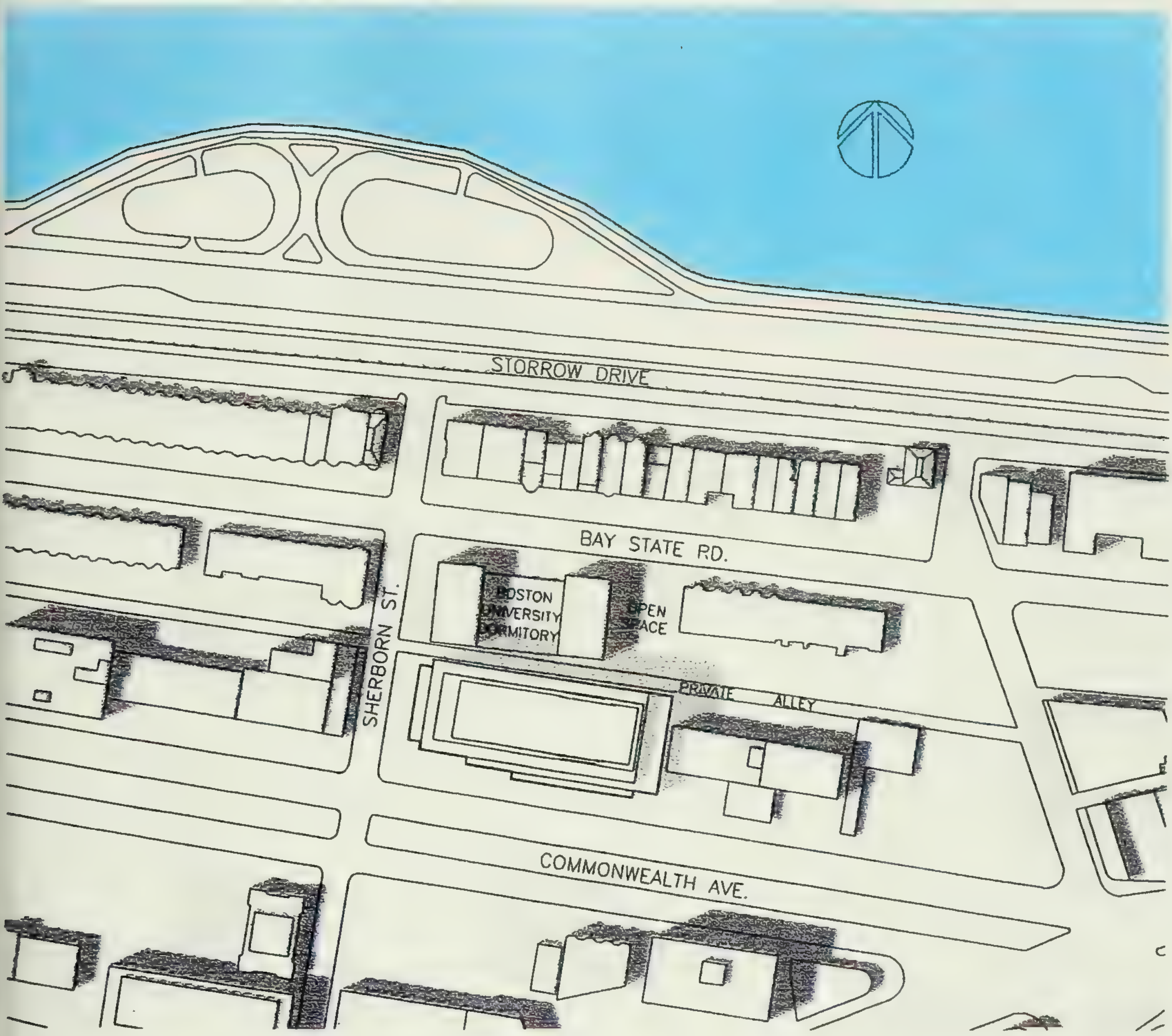
Figure 5-11



Shadow June 21, 3:00 PM (10 Story)

Prepared By:
Rowan Williams Davies & Irwin Inc.

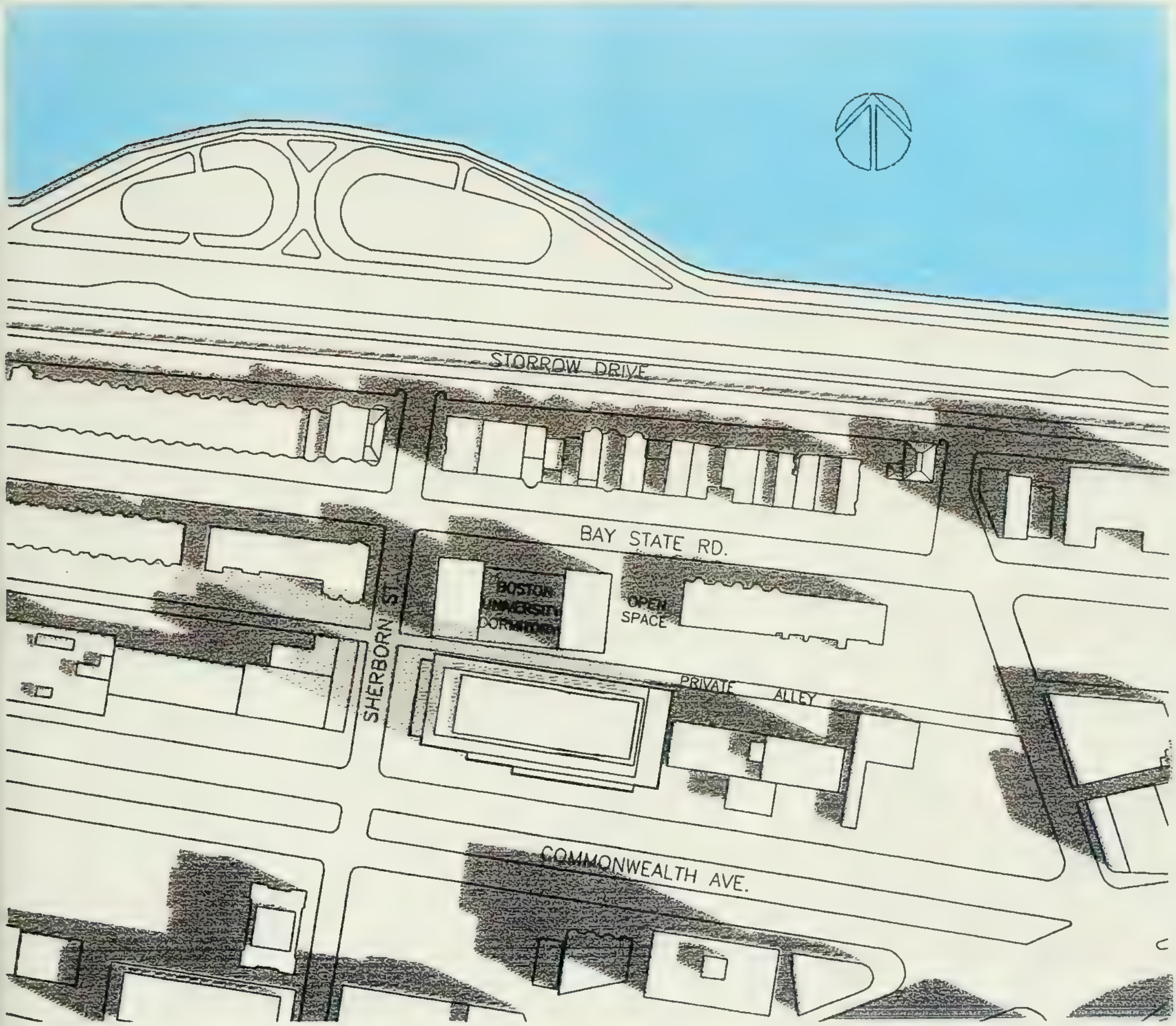
Figure 5-12



Shadow June 21, 3:00 PM (9 Story)

Prepared By:
Rowan Williams Davies & Irwin Inc.

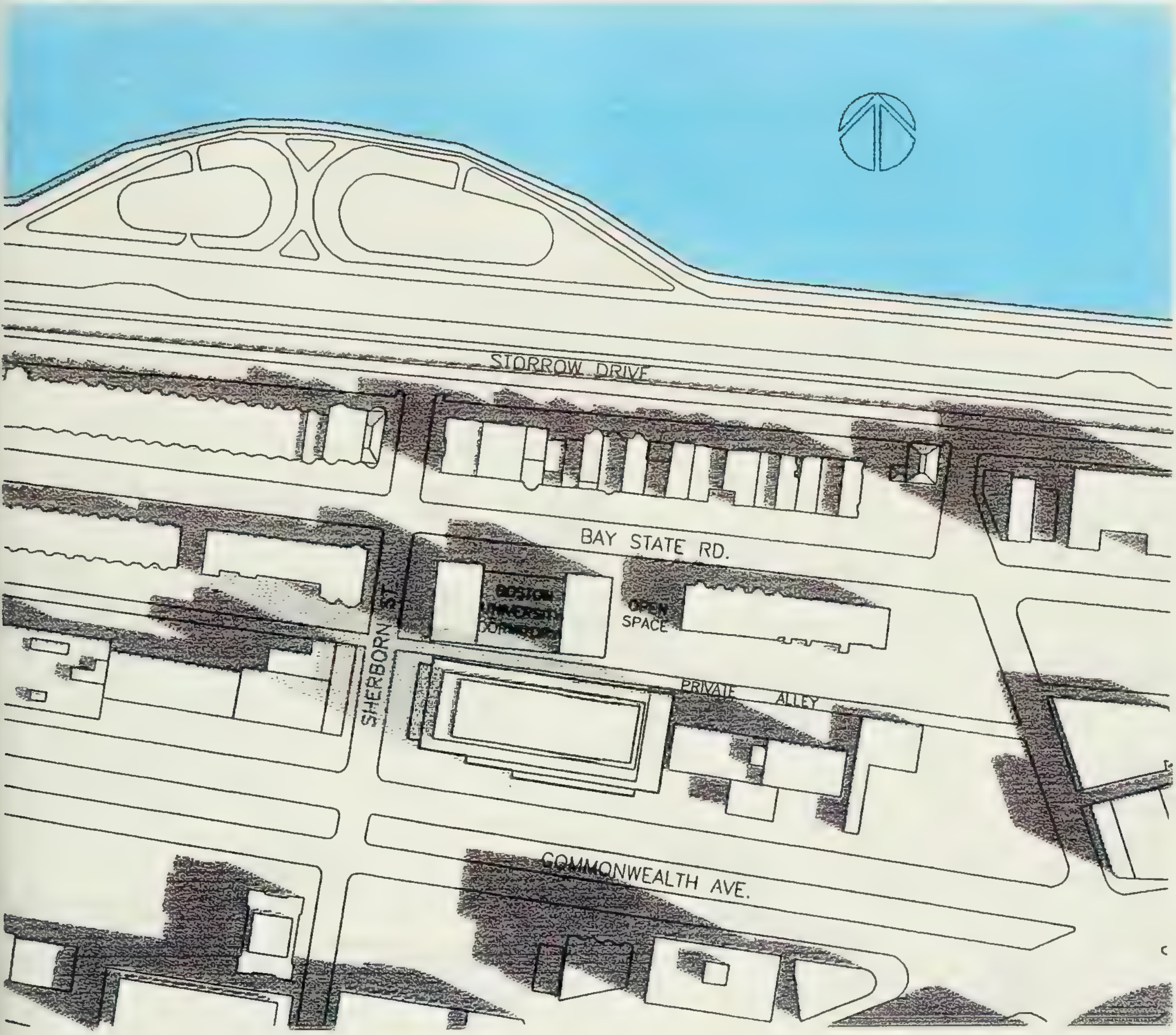
Figure 5-13



Shadow September 21, 9:00 AM (10 Story)

Prepared By:
Rowan Williams Davies & Irwin Inc.

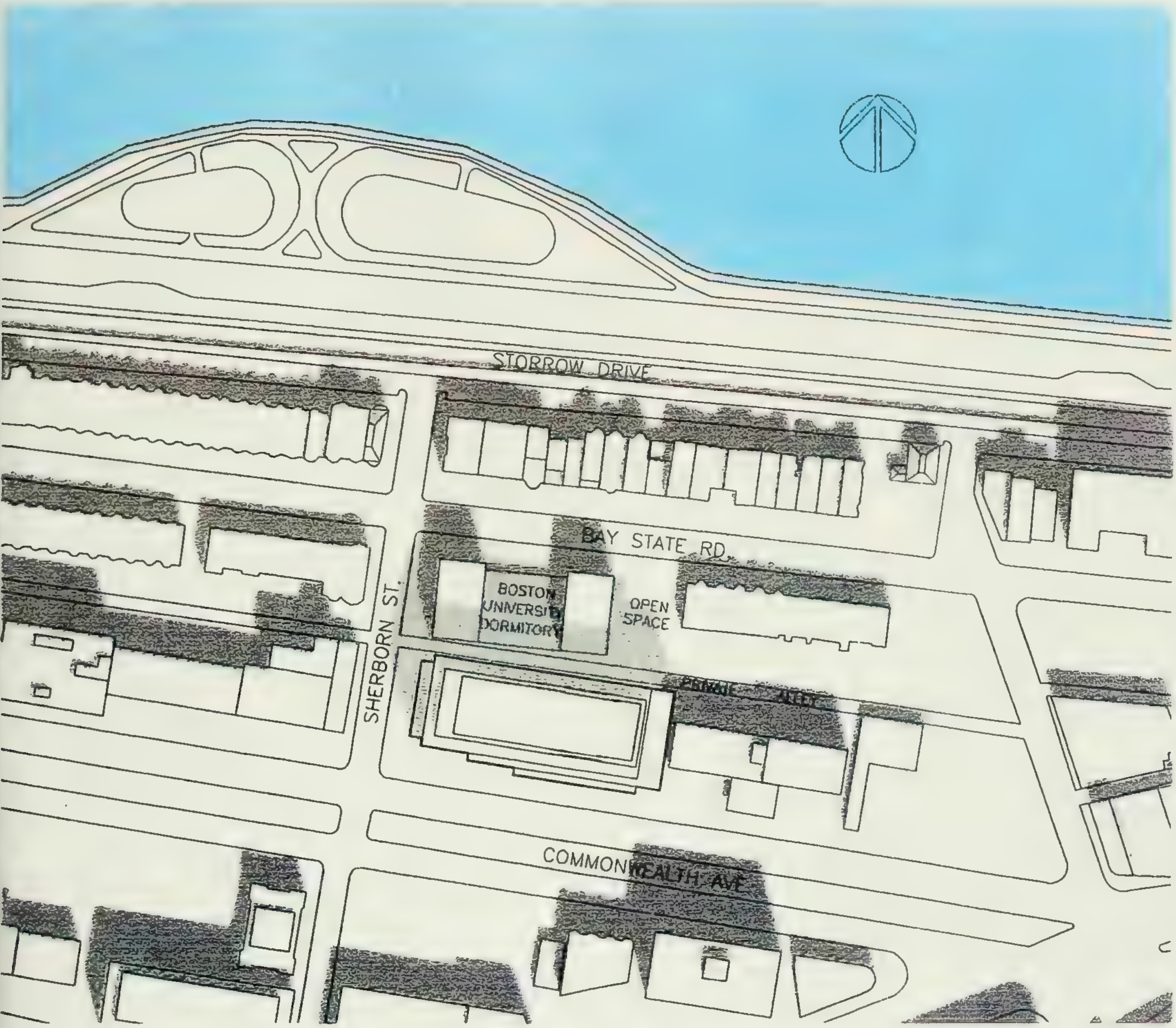
Figure 5-14



Shadow September 21, 9:00 AM (9 Story)

Prepared By:
Rowan Williams Davies & Irwin Inc.

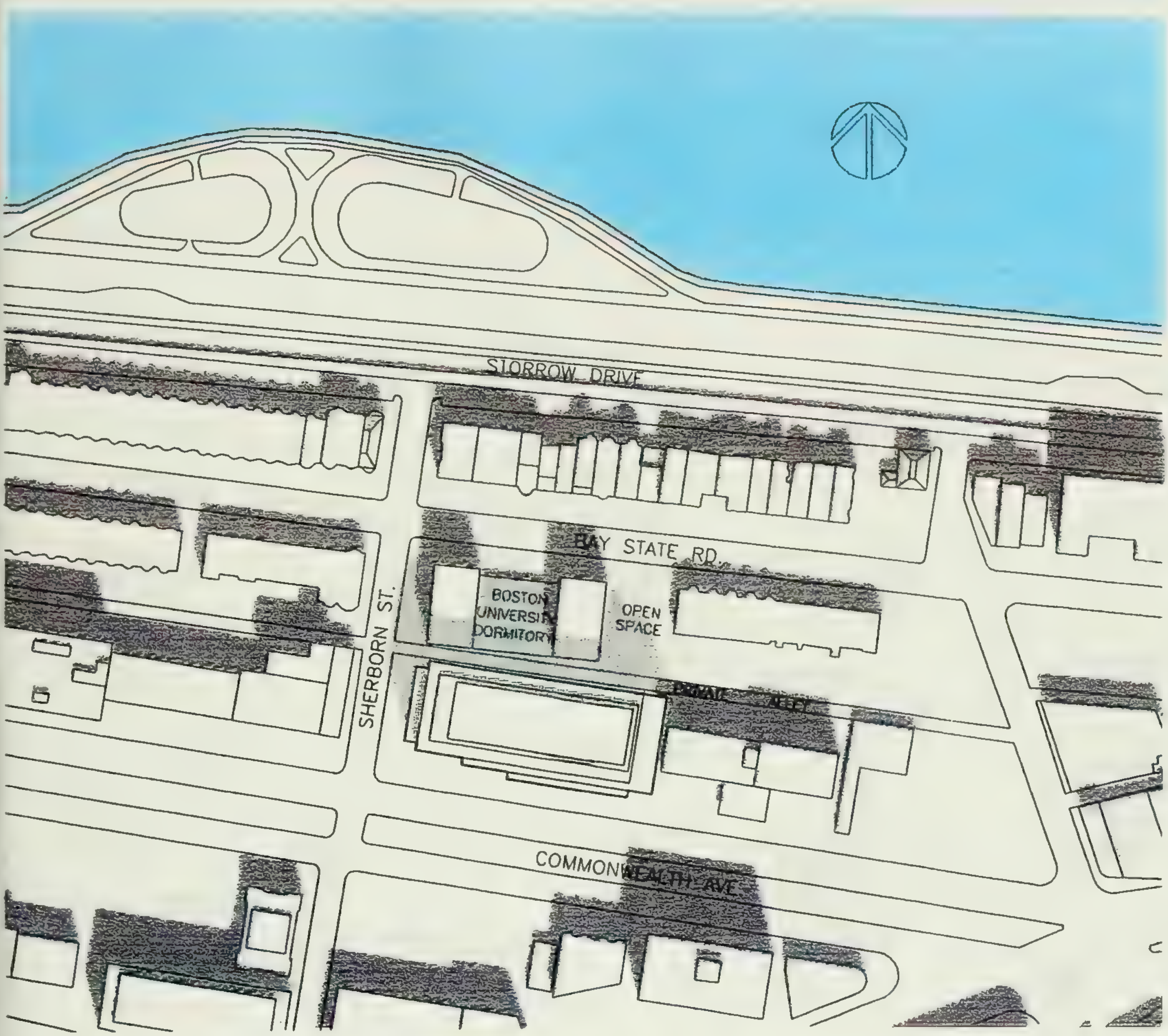
Figure 5-15



Shadow September 21, Noon (10 Story)

Prepared By:
Rowan Williams Davies & Irwin Inc.

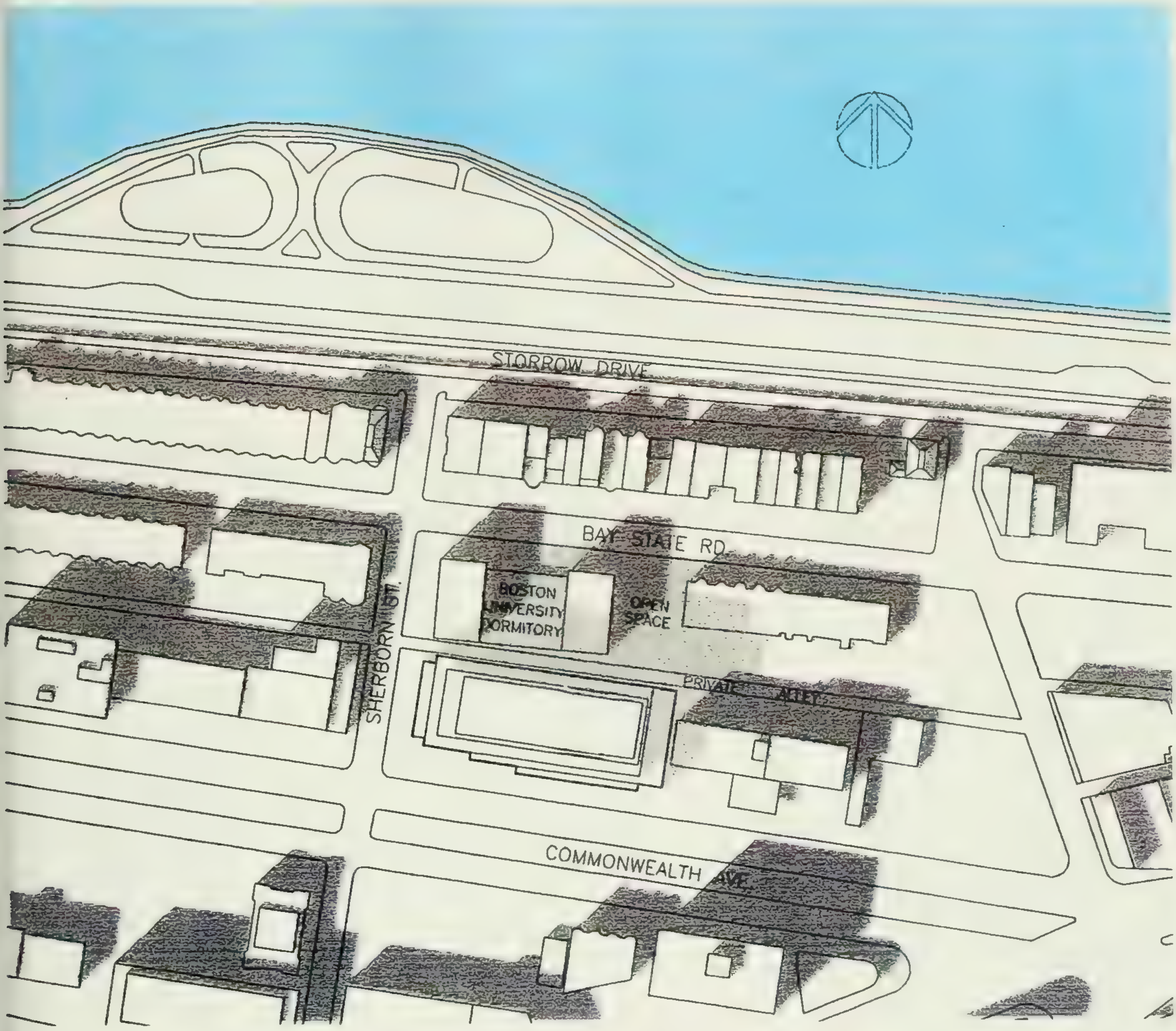
Figure 5-16



Shadow September 21, Noon (9 Story)

Prepared By:
Rowan Williams Davies & Irwin Inc.

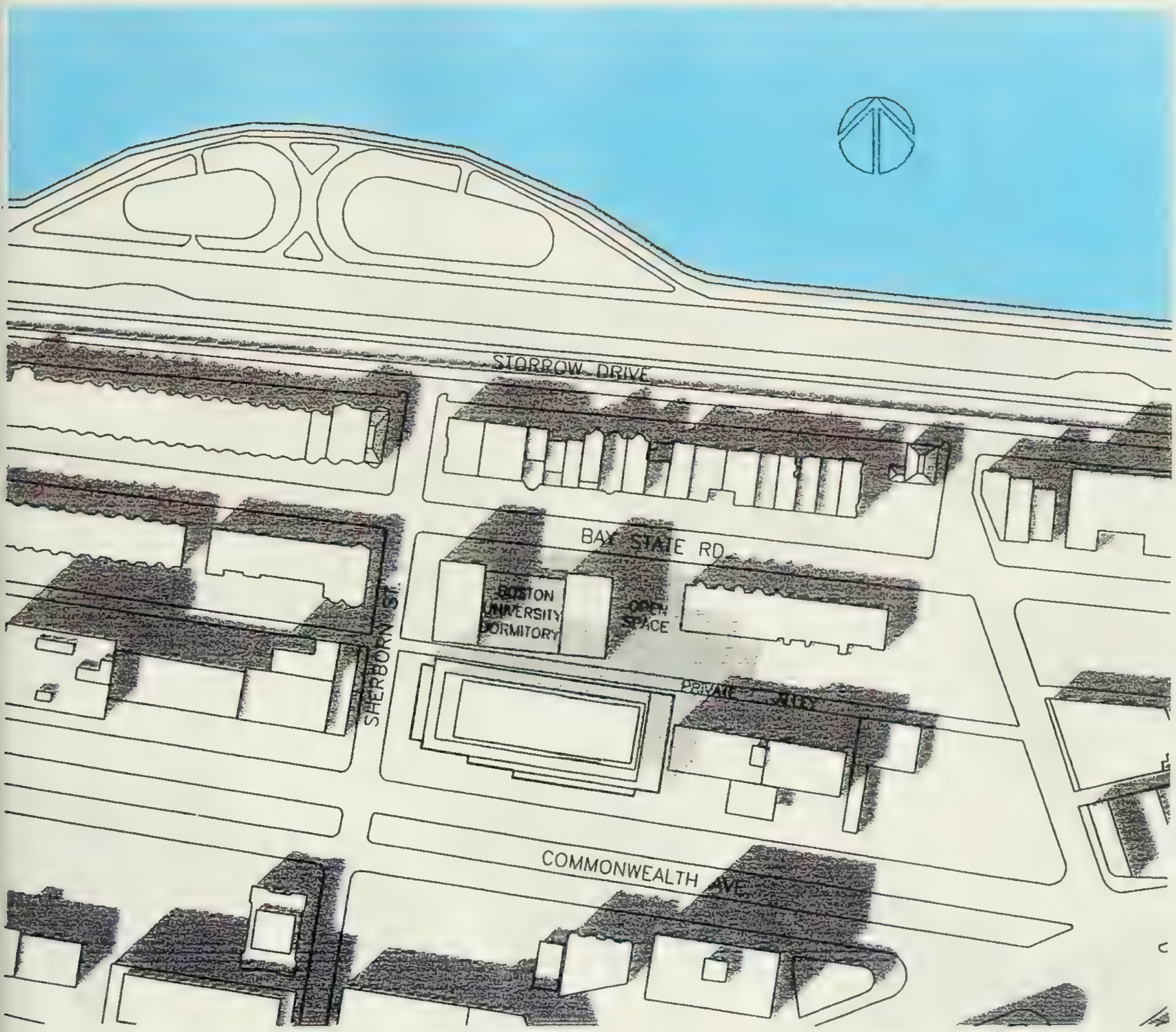
Figure 5-17



Shadow September 21, 3:00 PM (10 Story)

Prepared By:
Rowan Williams Davies & Irwin Inc.

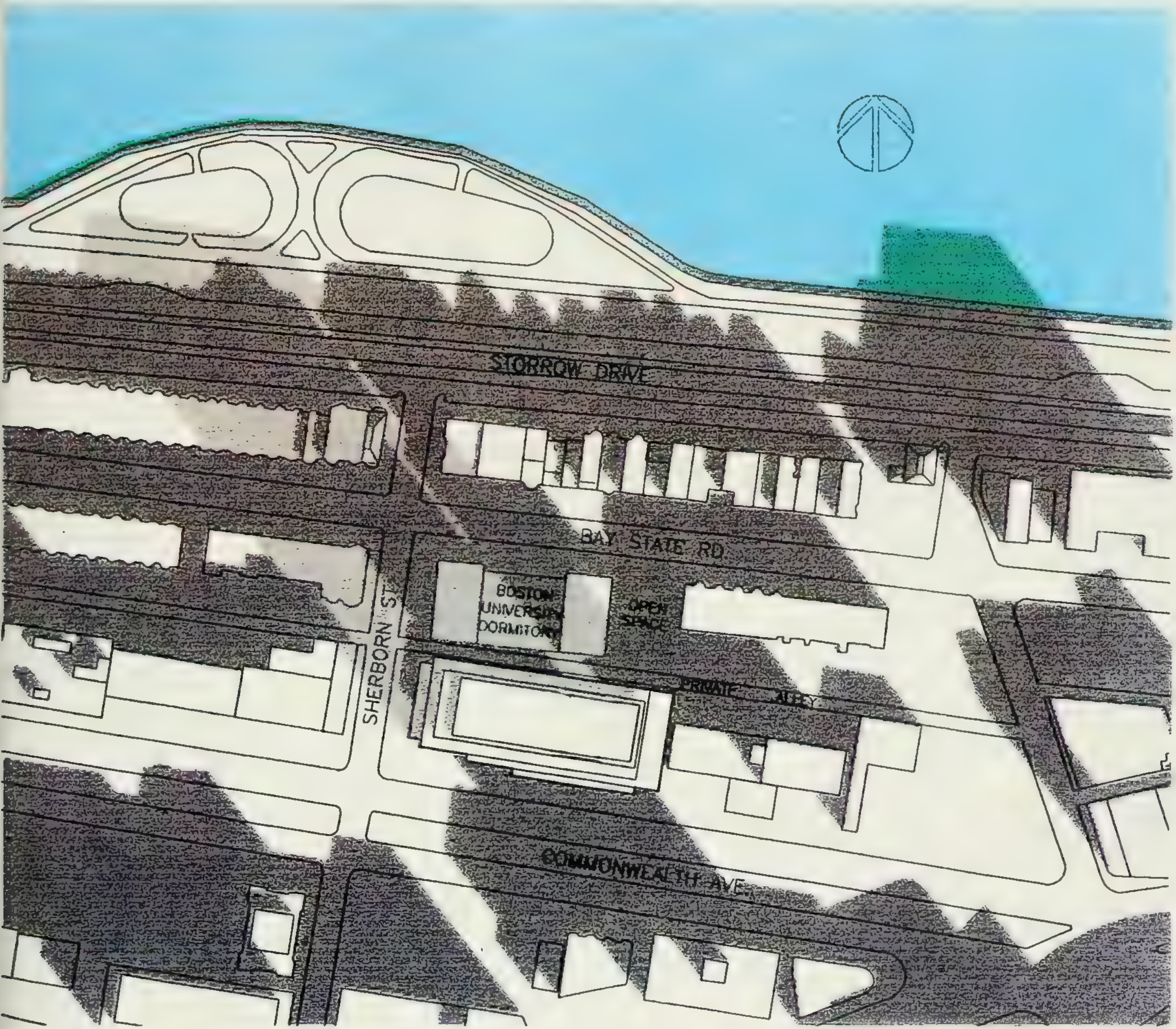
Figure 5-18



Shadow September 21, 3:00 PM (9 Story)

Prepared By:
Rowan Williams Davies & Irwin Inc.

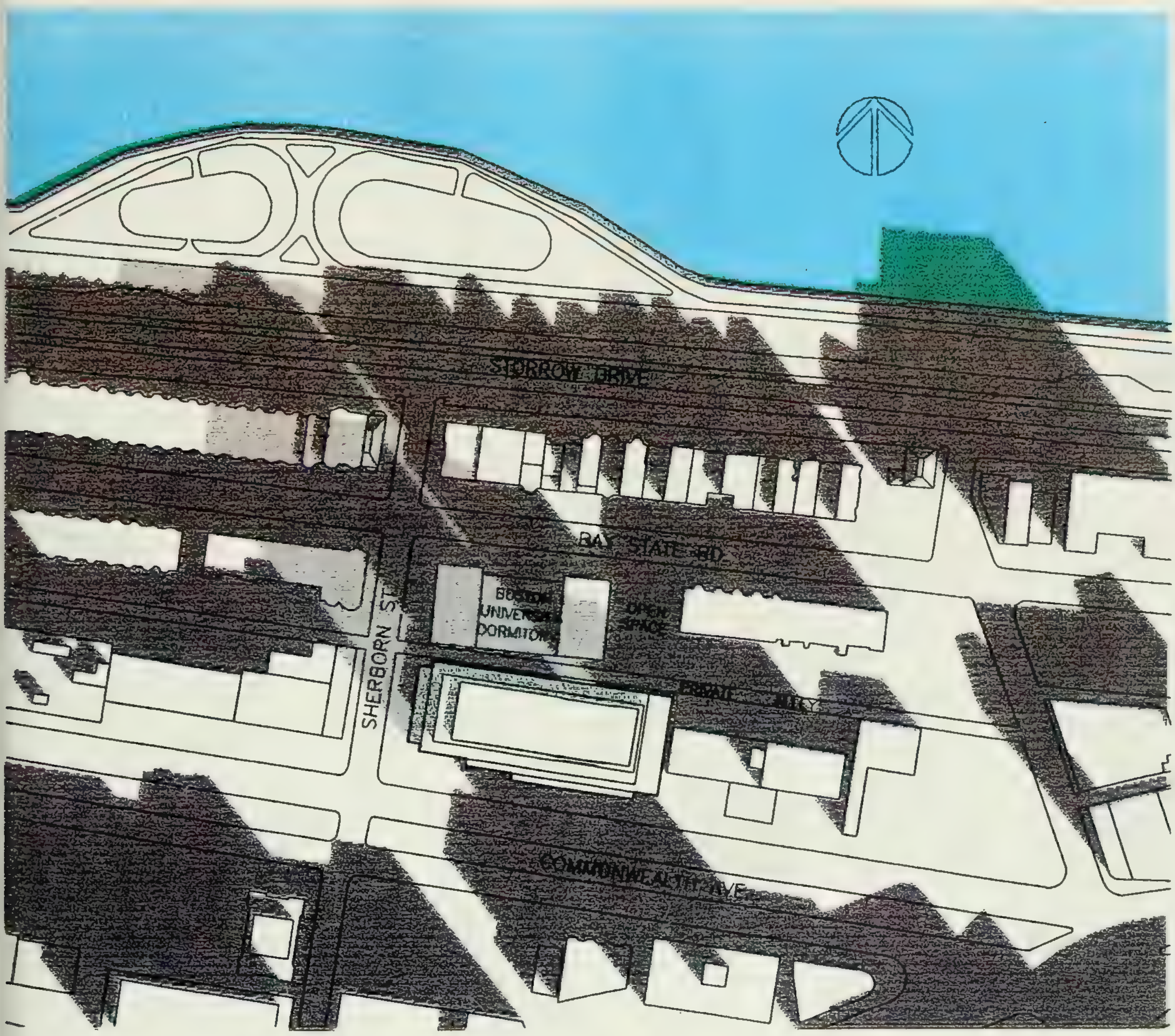
Figure 5-19



Shadow December 21, 9:00 AM (10 Story)

Prepared By:
Rowan Williams Davies & Irwin Inc.

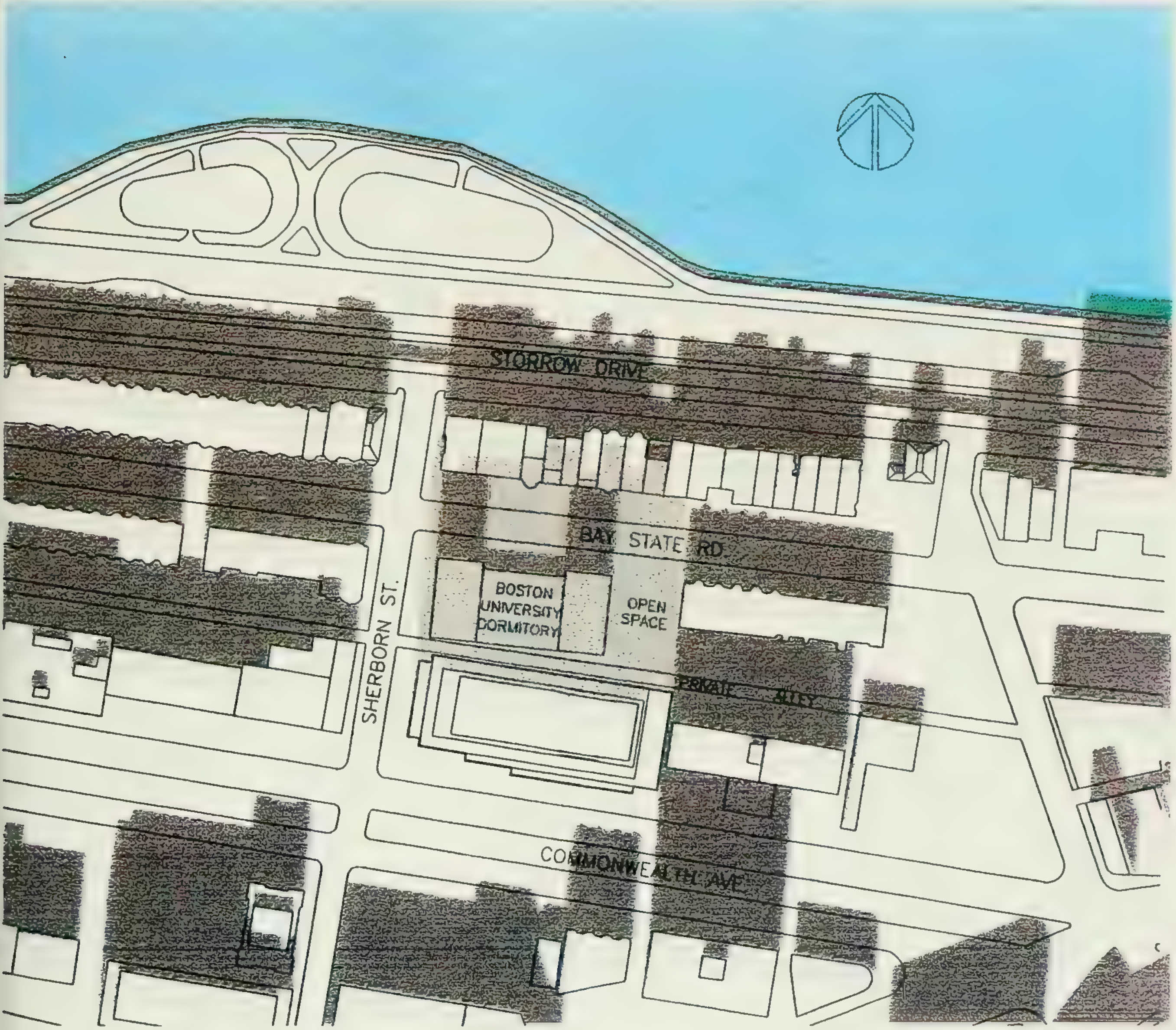
Figure 5-20



Shadow December 21, 9:00 AM (9 Story)

Prepared By:
Rowan Williams Davies & Irwin Inc.

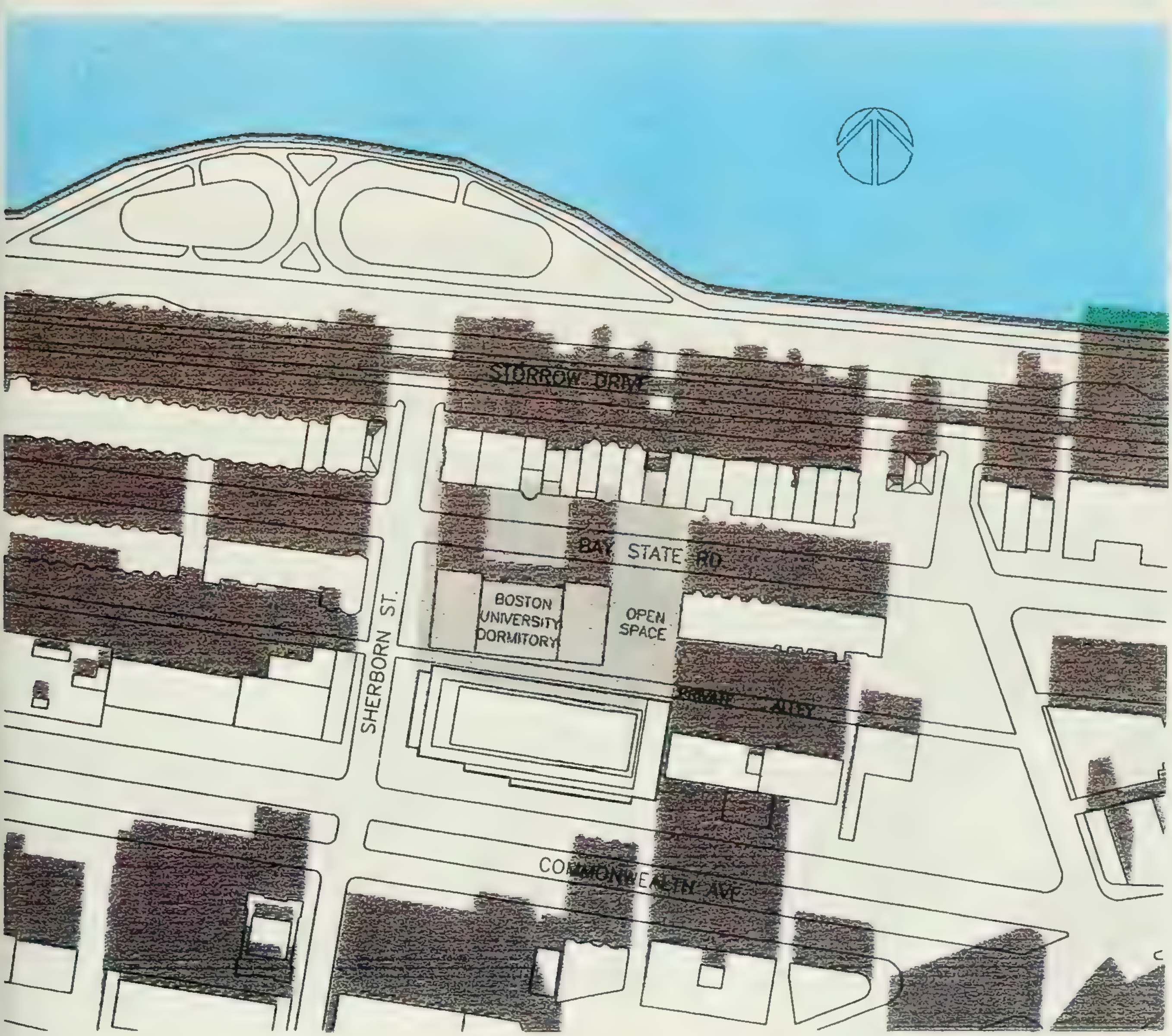
Figure 5-21



Shadow December 21, Noon (10 Story)

Prepared By:
Rowan Williams Davies & Irwin Inc.

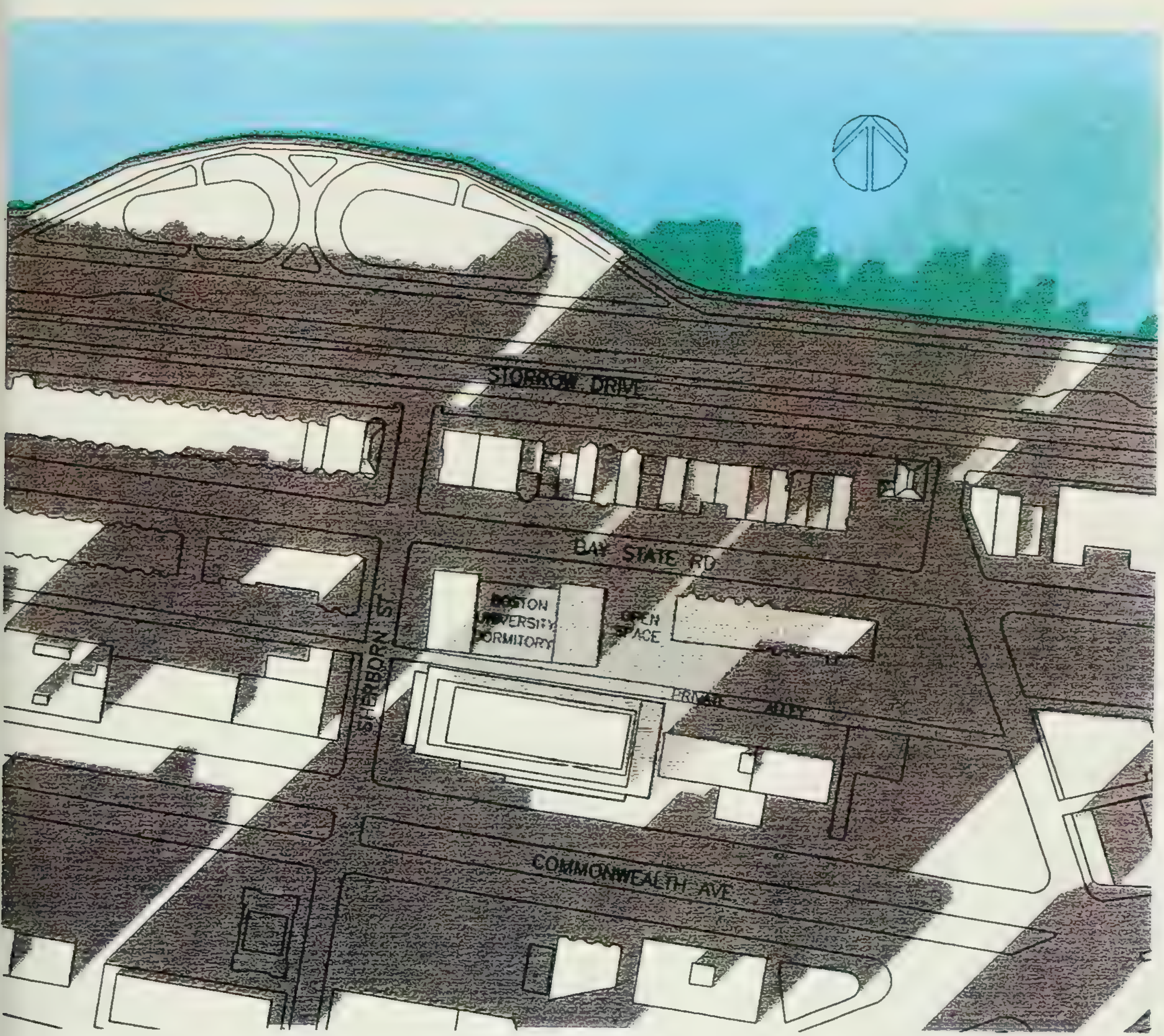
Figure 5-22



Shadow December 21, Noon (9 Story)

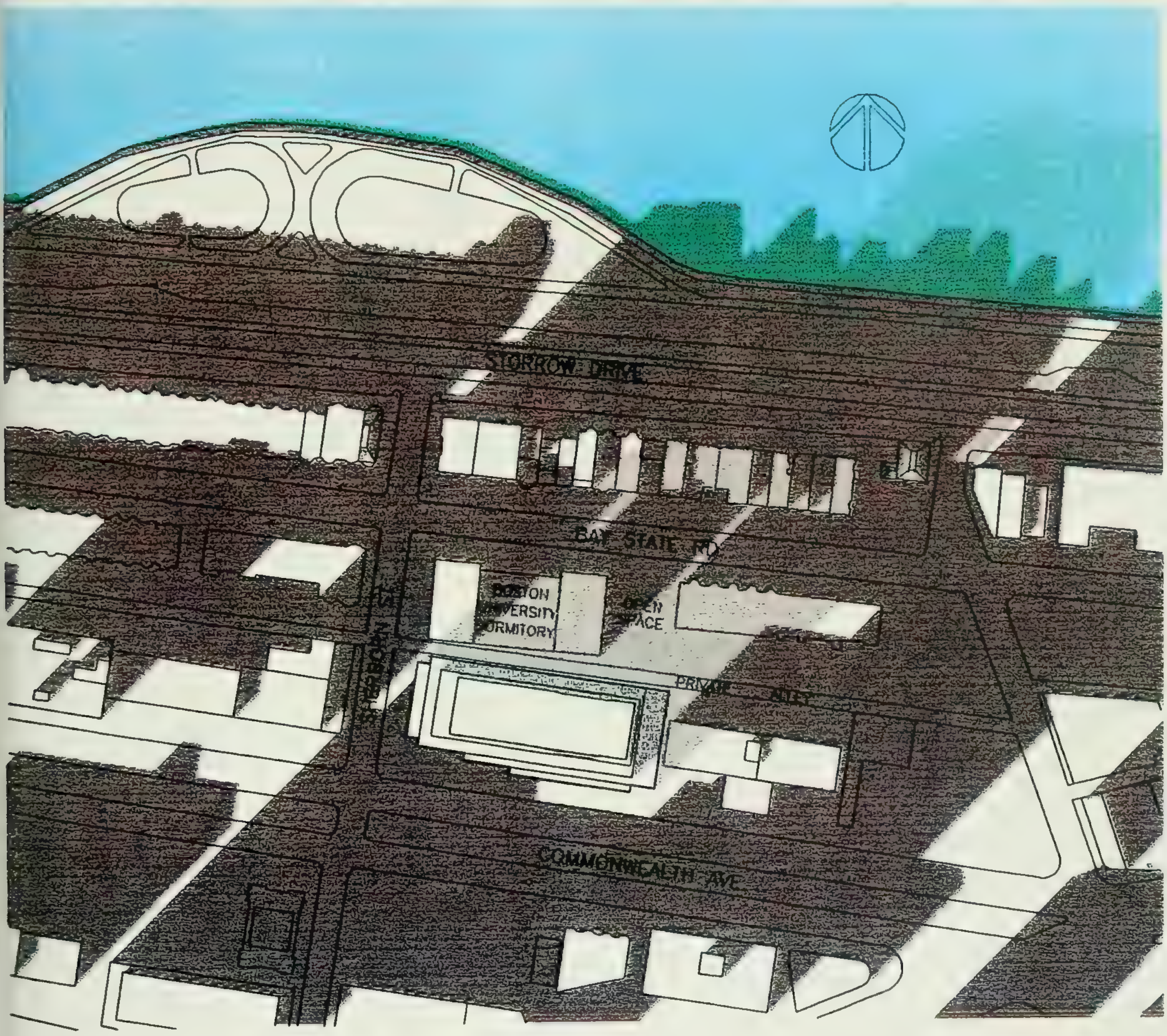
Prepared By:
Rowan Williams Davies & Irwin Inc.

Figure 5-23



Shadow December 21, 3:00 PM (10 Story)

Prepared By: Rowan Williams Davies & Irwin Inc.	***Figure 5-24***



Shadow December 21, 3:00 PM (9 Story)

Prepared By:
Rowan Williams Davies & Irwin Inc.

Figure 5-25

6.0 DAYLIGHT

6.0 DAYLIGHT

6.1 INTRODUCTION

A daylight analysis was conducted for both the nine and ten story alternatives for the Boston University new School of Management utilizing the Boston Redevelopment Authority's Daylight Analysis (BRADA) computer software. This program analyzes a building's silhouette to ascertain how much daylight is perceived by a viewer at ground level locations selected by the BRA. The results of the program contrast the percentage of daylight obstructed by a building to the percentage obstructed if the same site were vacant. For comparison purposes, an analysis was also conducted on Kenmore Tower, a similar building.

6.2 METHODOLOGY

As specified in the BRA Scoping Determination, two viewpoints were used in the analysis: Commonwealth Avenue and Sherborn Street. Both were centered on the building's corresponding facade from the middle of the street as specified in the model. For comparison, an analysis using the BRADA program was performed on a building located in close proximity to the new School of Management site, Kenmore Tower, located at 566 Commonwealth Avenue (see Figure 6-1).

Due to the 150 foot maximum street width limitation of the BRADA software, it was necessary to interpolate in order to achieve the results for a 160 foot wide location in the center of Commonwealth Avenue. By calculating the percentage of obstruction at intervals of ten feet, beginning with a street width of 80 feet and increasing it to 150 feet, it was established that for every increase in width of 10 feet of street, there is a corresponding decrease in daylight values of approximately 2%.

6.3 RESULTS

The first analysis of the amount of daylight obstructed by the ten story alternative for the new School of Management was done from the center of Commonwealth Avenue on the south-facing facade of the proposed building. As discussed above, the width of Commonwealth Avenue input into the formula had to be reduced from 160 feet to 150 feet. The daylight analysis for the ten story building would yield a percentage of 59.1% (see Figure 6-2). To allow for the additional 10 feet of road width, it was necessary to adjust this figure approximately -2%, giving a final daylight obstruction of 57.1% . The nine story building alternative analysis revealed a 54.1% daylight value (see Figure 6-3). Allowing a -2% adjustment for the road width, the final daylight value is 52.1%.

The west-facing facade of both the nine and ten story buildings was analyzed from the center of Sherborn Street. For both the nine and ten story alternatives, the daylight obstructed by each facade was analyzed in successive steps due to the progressive stepping of the height of the building along Sherborn Street. The results of the daylight analysis show a consistent 50.6% daylight obstruction from this vantage point for both Project alternatives (see Figures 6-4, 6-5).

To evaluate the new School of Management, it was recommended by the BRA that a daylight analysis also be performed on a second comparable building in the area. The Kenmore Tower, a private apartment complex located at 566 Commonwealth Avenue, was chosen because of its close proximity to the Project site. It is located diagonally across Commonwealth Avenue from the Project site, and has setback and massing characteristics similar to the Project. Hence, the percentage of daylight obstruction for the Kenmore Tower building established a reasonable comparable percentage to a proposed new building located in the same area. The vantage point for the daylight analysis of this building was located in the midpoint of Commonwealth Avenue centered on the building's north-facing facade. The result of the analysis produced a value of 54.2% When reduced by 2%± to allow for the additional width of Commonwealth Avenue, the daylight obstruction for this site was 52.2%. Table 6-1 shows a comparison summary of the analyses.

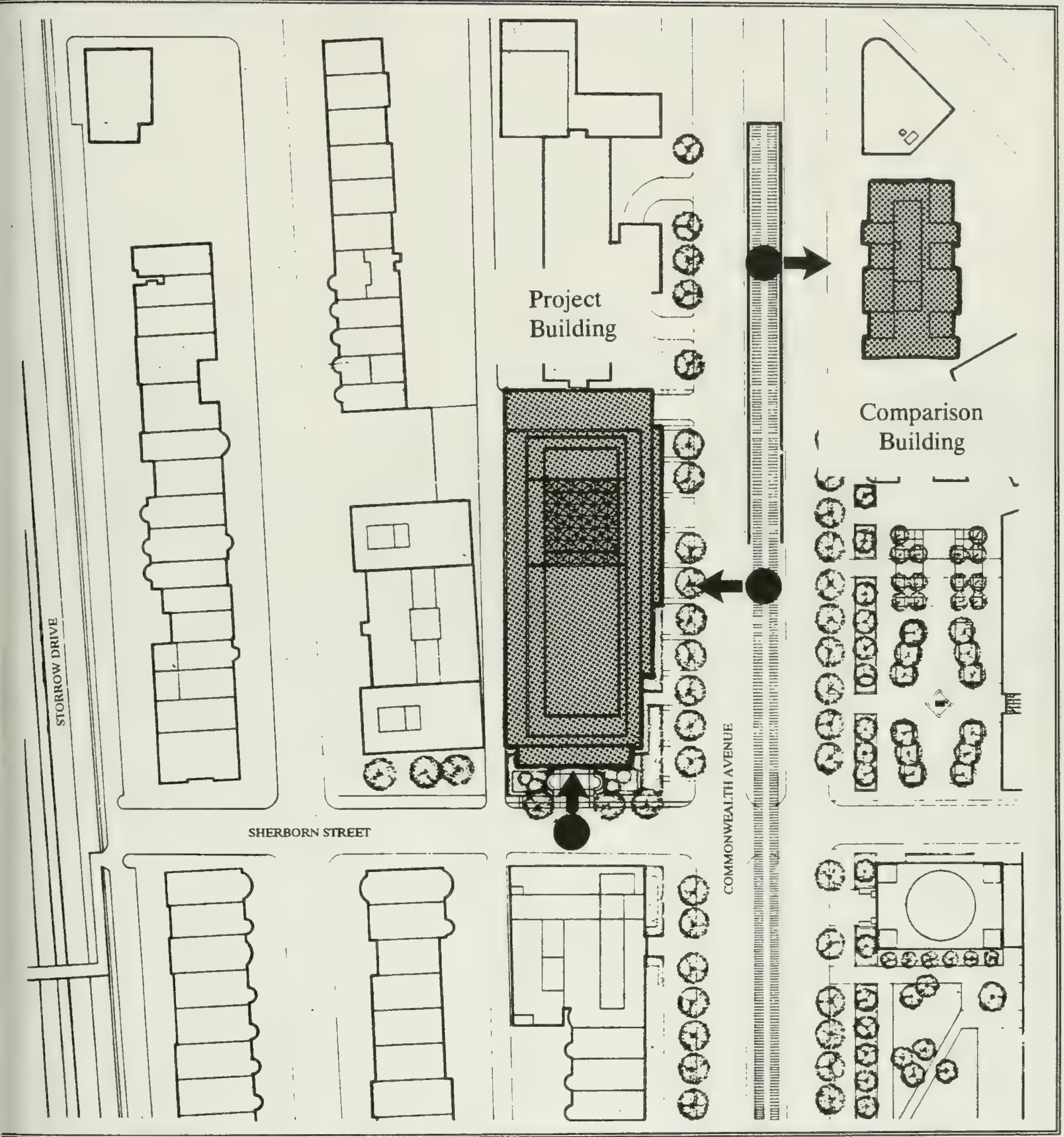
TABLE 6-1
Daylight Obstruction Values
(BRADA)

	Ten	**Nine**	**Comparison**
Commonwealth Ave.	57.1[1]	54.1[1]	52.5[1]
Sherborn St.	50.6	50.6	N/A

[1] Adjusted -2% for street width.

The BRADA analysis shows that the percentages of daylight obstruction for both nine and ten story alternatives for the new School of Management and the Kenmore Tower Apartments are in the same range. The nine story alternative offers approximately a 3% reduction in daylight obstruction as compared to the ten story alternative.

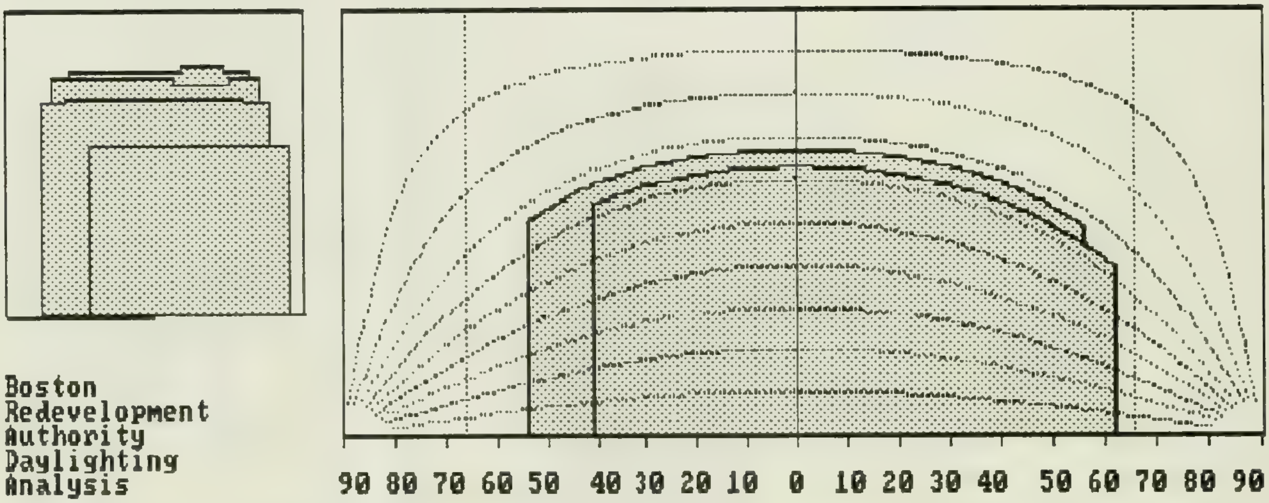
The daylight analyses indicated that the Project impacts on daylight are consistent with other existing buildings in the area. There will be a minimal change in the perception of daylight to a person on the street. Commonwealth Avenue is a wide boulevard, wider than other streets in the area, offering generous sidewalks. In addition, there is a variety of building heights along both sides of the street, as well as an open space across Commonwealth Avenue from the proposed building. Thus, in the area of the proposed project, a person at street level has the impression of open spaces, long views, and distant vistas. Additional discussion of comparative building heights is discussed in Chapter 3.0, Urban Design.



View Orientation Plan

Prepared By:
Fort Point Associates

Figure 6-1



Adjusted daylight obstruction is 59.1 %

Commonwealth Ave.

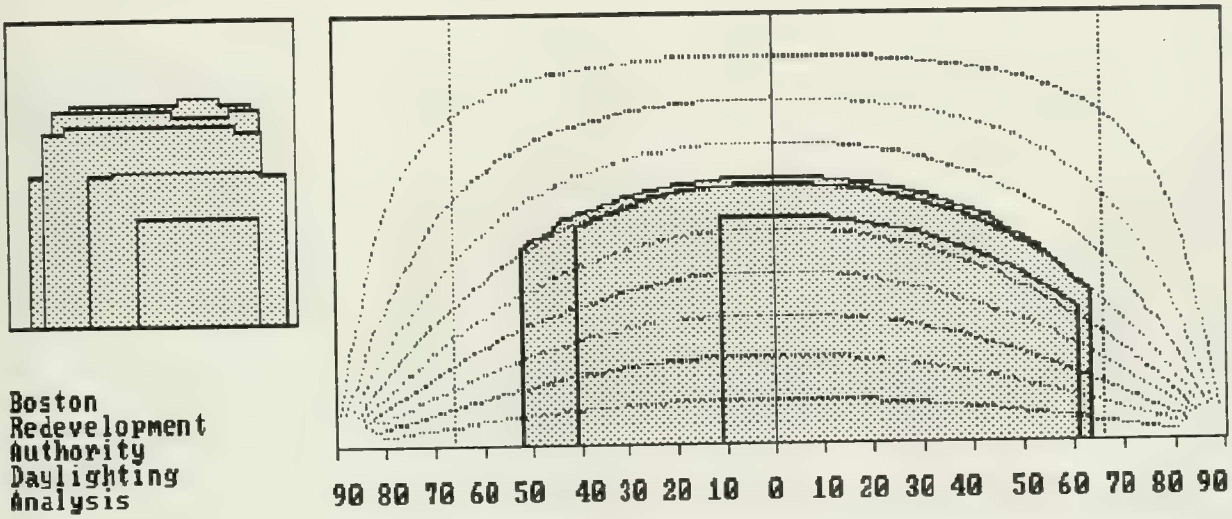
10 Story

Project from Commonwealth Avenue (10-Story)

Prepared By:

Fort Point Associates

Figure 6-2



Adjusted daylight obstruction is 54.1 %

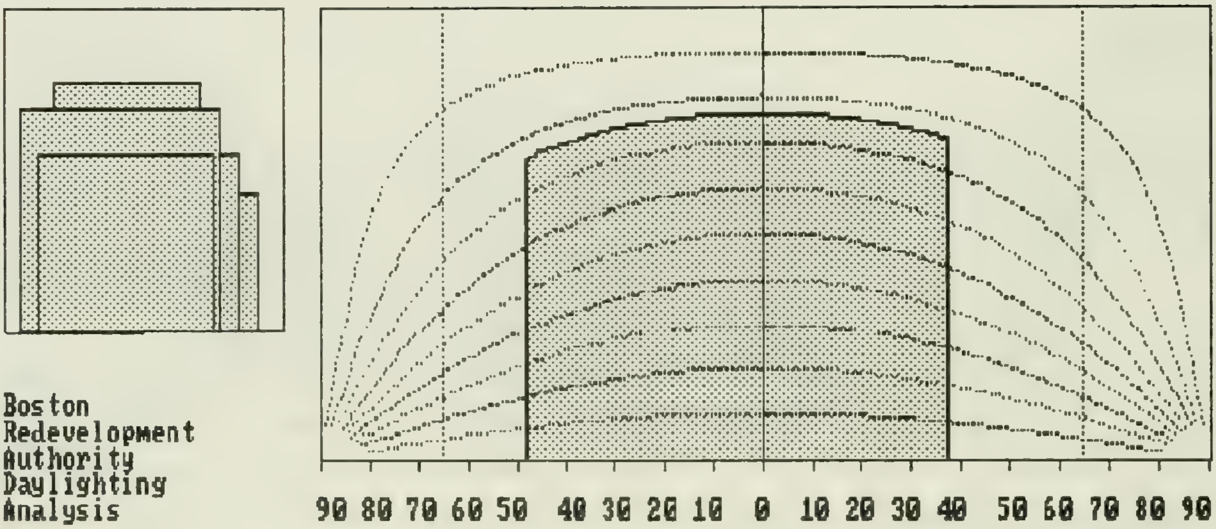
Commonwealth Ave.

9 Story

Commonwealth Ave. Perspective (9 Story)

Prepared By:
Fort Point Associates

Figure 6-3

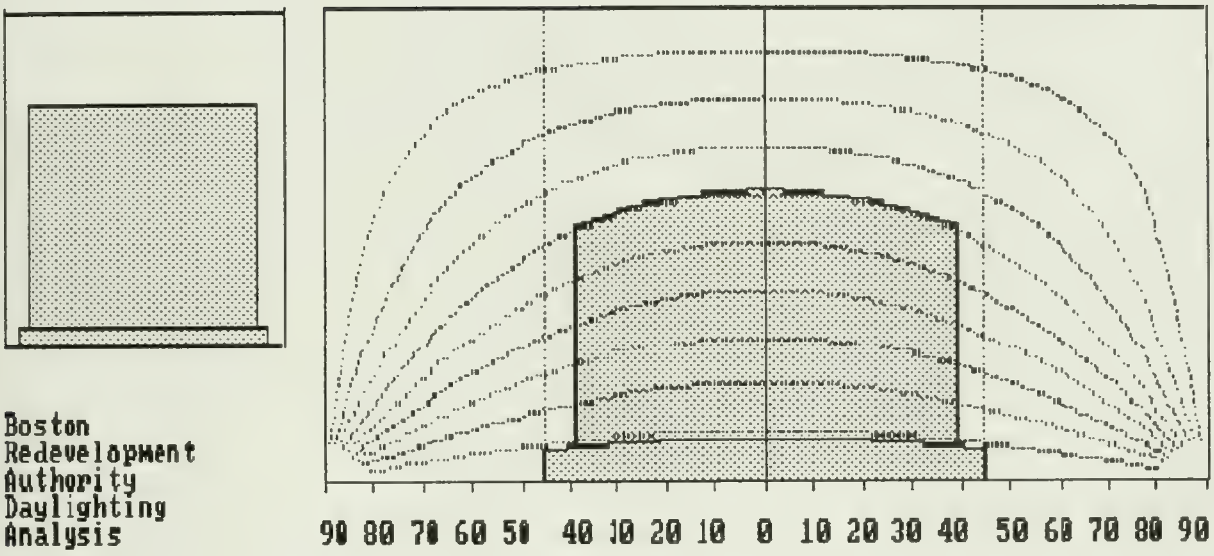


Obstruction of daylight by the building is 50.6 %
Sherborn St.

Project from Sherborn Street (9 and 10 Story)

Prepared By:
Fort Point Associates

Figure 6-4



Adjusted daylight obstruction is 54.2 %
556 Commonwealth Ave.

Comparison Building: 566 Commonwealth Avenue

Prepared By:
Fort Point Associates

Figure 6-5

7.0 NOISE

7.0 NOISE

7.1 INTRODUCTION

This chapter addresses the potential impact of the new School of Management project construction and operations on area noise levels, and describes mitigation measures that will be used to ensure that any Project-related noise during and after construction will meet acceptable levels as defined by applicable regulations of the City of Boston. The University, as the owner of adjacent residential and academic buildings housing its staff and students, is especially concerned about the need to control noise emanating from construction and building operations at all times.

The site for the Project is located in a busy urban setting along Commonwealth Avenue. It is also located close to buildings with mechanical systems which contribute to the ambient noise levels. Sensitive receptors in the immediate vicinity of the Project site include the Boston University dormitory, private residences on Bay State Road, and the Howard Johnson's Motor Lodge. The differences in noise levels between the nine and ten story alternatives are very minor. Where there is a significant difference, it is discussed, otherwise, there is no significant difference between alternatives.

7.2 TRAFFIC

The primary source of ambient noise levels is from public transportation (vehicles such as buses, trolleys) occurring along Commonwealth Avenue and general vehicular traffic in the area. The increase in traffic levels associated with the Project is not expected to increase traffic volumes significantly and therefore will not create a significant noise impact. Additional information on traffic can be found Chapter 14.0, Transportation.

7.3 CONSTRUCTION

All construction work at the site must be performed in accordance with the Regulations for Control of Noise in the City of Boston. Furthermore, a Construction Management Plan will be prepared, approved by the Boston Transportation Department (BTD), and implemented during construction. Among other issues, this plan will stipulate protocols to be followed by the contractors in order to manage noise at the site. This plan will define construction hours, truck routes, procedures for the periodic inspection of mufflers to ensure their proper operating condition, and procedures for monitoring vibration during construction (most particularly during the site preparation and excavation phases). A more complete discussion of construction noise may be found in Chapter 11.0, Construction.

7.4 EXTERIOR MECHANICAL SYSTEMS

Mechanical systems for the new School of Management project are designed to achieve the noise standards set forth in the Regulations for the Control of Noise in the City of Boston (Section 16-26 City of Boston Code, Volume I, Ordinances).

Most of the mechanical equipment with the potential to emit noise is located on top of the building in an enclosed mechanical penthouse, set back from the edge of the building. The systems contained therein include air handling units (AHUs) and their associated return/exhaust fans, cooling towers, and an emergency generator. There are also garage supply and exhaust fans located on all three parking levels below grade. The garage intake is located in the ground on the south side of the building. The garage exhaust is accommodated through two louvers at the ground level, approximately 4 to 10 feet above grade on the norht side of the building.

The mechanical penthouse for the nine story alternative is located approximately 150 feet from the ground. This is about 15 feet lower than the ten story alternative, which is located approximately 165 feet above the ground. The height of the penthouse above the ground helps reduce ground level noise from mechanical equipment contained in the penthouse. The expected noise levels from penthouse equipment at various receiver locations are tabulated below in Table 7-1. Source and receiver locations are shown on Figures 7-1 through 7-4.

Table 7-1
Total Noise from Penthouse
Noise Sources**(Day/Night)*

Building	**Noise**	**Predicted Nine Story Noise Level**		**Predicted Ten Story Noise Level**	
Side	Criteria	at Ground	at Upper Floor	at Ground	at Upper Floor
North	60/50 dBA	48/38 dBA	52/42 dBA	47/37 dBA	50/40 dBA
South	65/65 dBA	46/46 dBA	49/49 dBA	45/45 dBA	47/47 dBA
East	65/65 dBA	53/53 dBA	59/59 dBA	52/52 dBA	57/57 dBA
West	60/50 dBA	41/41 dBA	46/46 dBA	40/40 dBA	44/44 dBA

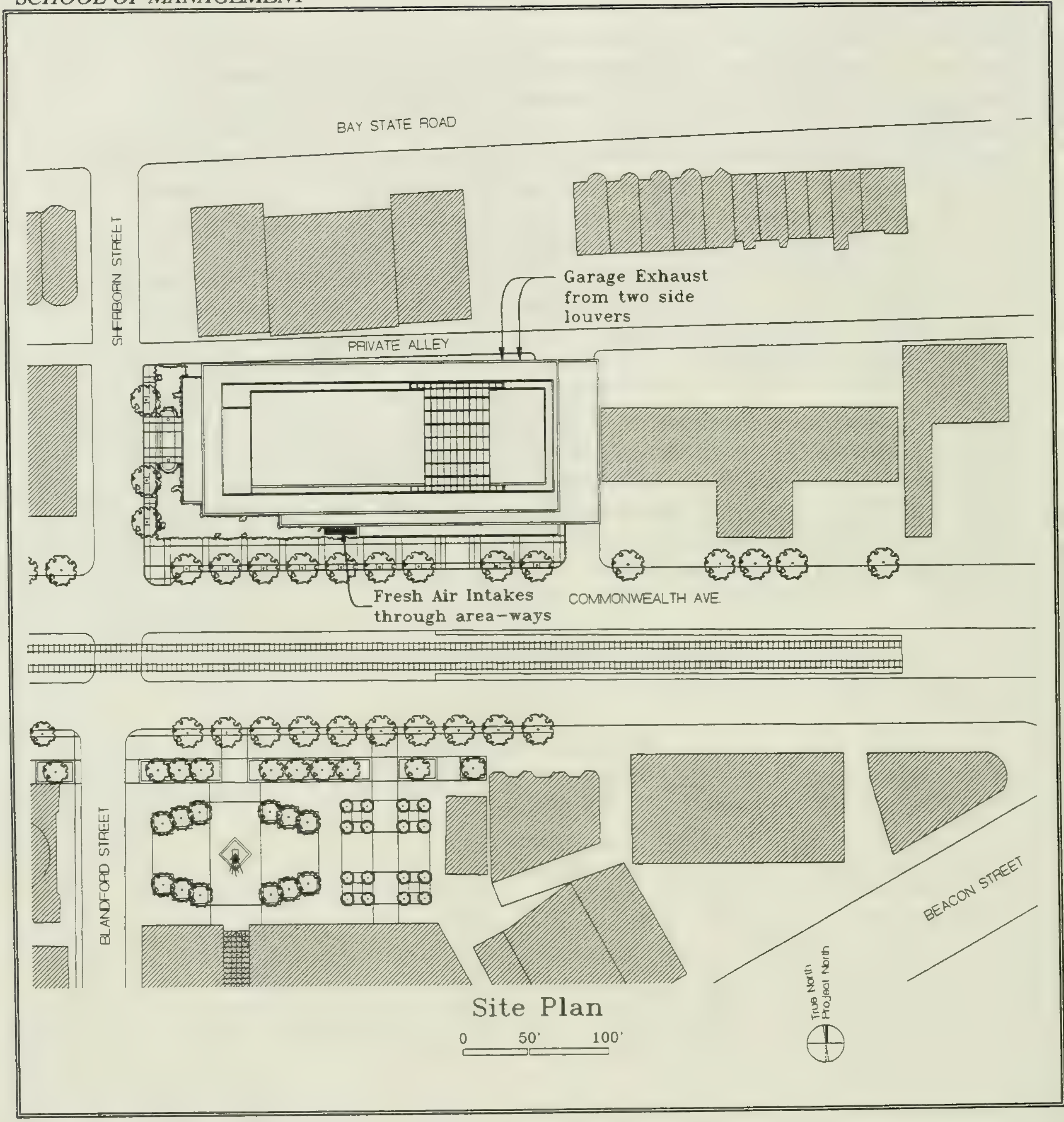
*AHU's and associated return/exhaust fans located in the penthouse impact noise levels on the north, south, and east sides of the building. The cooling towers impact noise levels on the West side of the building.

Source: Acentech Inc.

As shown above, the expected noise levels are well below the applicable City of Boston criteria for both the nine and ten story alternatives.

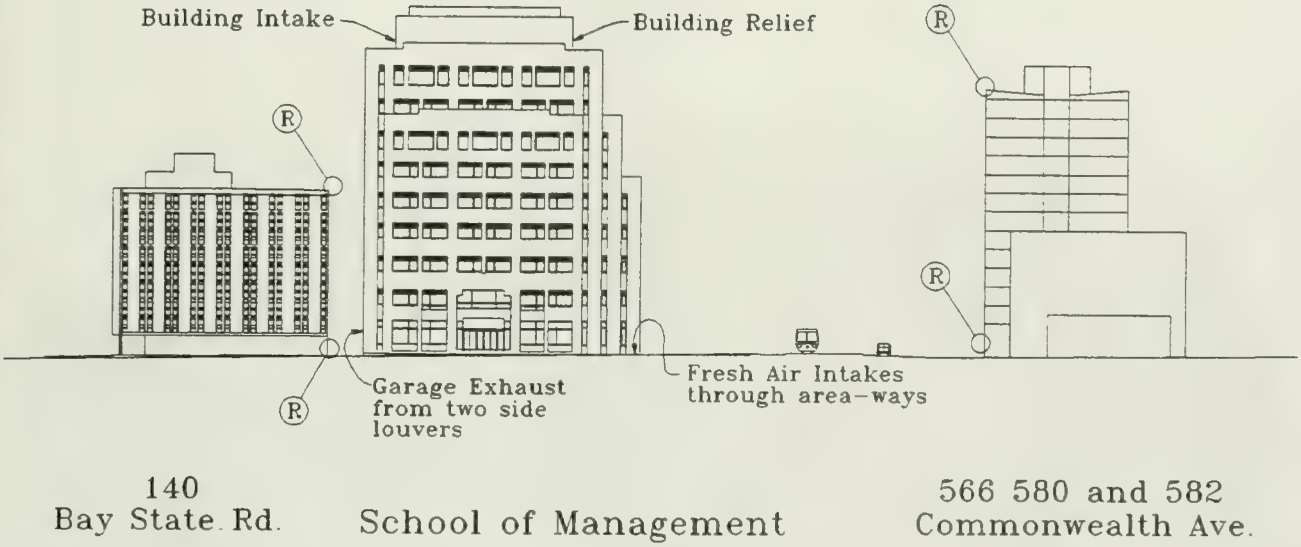
Garage exhaust and supply fans will be provided with duct silencers to reduce noise levels produced at nearby or adjacent property lines (whichever is closer to the louvers) to approximately 50 to 60 dBA during the day and about 45 dBA at night. The fans for these systems have two speed controls, the higher of which is expected to be required only for a few hours each day, during the morning and evening rush when the greatest number of cars are moving in the garage. These will likely coincide with peaks in ambient environmental noise due to concurrent activities in the area. Otherwise, the fans are expected to operate at low speed, at much lower noise levels, or be off when the control sensors in the garage indicate that ventilation fans are not needed. The predicted daytime noise levels given in the preceding table assumed high speed fan operations in the indicated level. Low speed operation is indicated in the nighttime case, although it is most likely that the fans will be off. These expected noise levels comply with the City of Boston noise regulation.

Emergency generators will operate only during emergencies or for short test periods. The tests will be conducted during normal work hours when the noise impact from the generator will be the least. Generator noise levels are expected to be approximately 50-55 dBA at upper levels of the nearest adjacent existing buildings and slightly lower at the ground level. Since community noise criteria are typically relaxed by about 10 dBA for emergency equipment, the expected emergency generator noise levels should be acceptable.



Noise Sources - Ground Level

Prepared By: Cannon	***Figure 7-1***


Building Intake
Building Relief
Ⓡ
Ⓡ
Ⓡ
Ⓡ
Garage Exhaust from two side louvers
Fresh Air Intakes through area-ways
140 Bay State Rd.
School of Management
566 580 and 582 Commonwealth Ave.

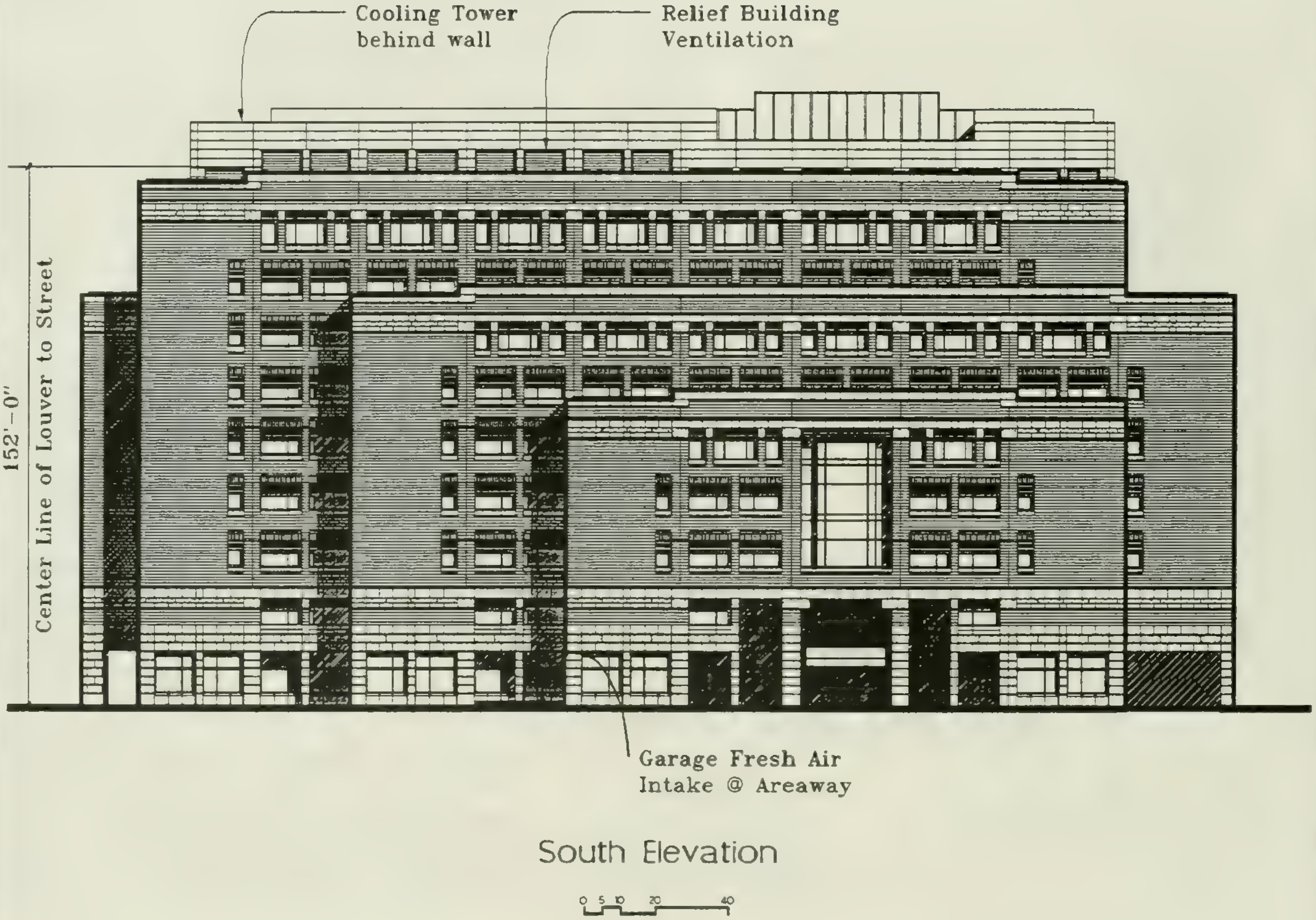
Section Along Sherborn and Blandford Streets Looking East

Ⓡ = Noise Receptor Locations

Noise Sources

Prepared By: Cannon

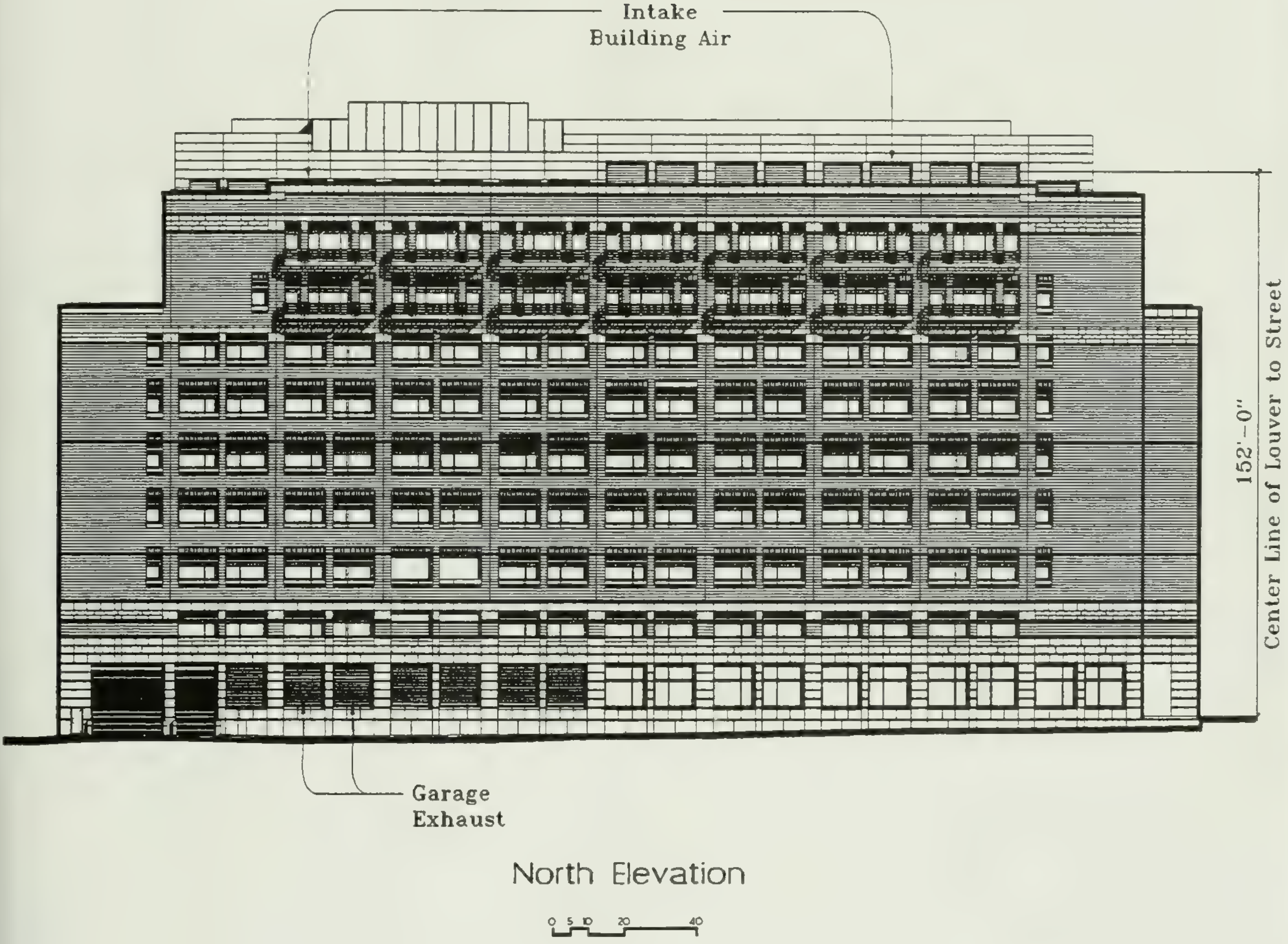
Figure 7-2



Noise Sources - South Elevation

Prepared By:
Cannon

Figure 7-3



Noise Sources - North Elevation

Prepared By: Cannon

Figure 7-4

8.0 AIR QUALITY

8.0 AIR QUALITY

8.1 INTRODUCTION

The generation of potential deleterious air emissions resulting from the Boston University new School of Management is expected to be minimal. As described in Chapter 14.0, Transportation, generation of new vehicular trips is not significant. Mechanical systems for the building will perform within state and local emission requirements. Construction related impacts will be minimized as described in Chapter 11.0, Construction Impacts. Differences in air quality impacts between the nine and ten story project alternatives are minimal.

8.2 TRAFFIC AND PARKING

Traffic Emissions

As detailed in Chapter 14.0, Transportation, the increase in traffic due to the proposed building will be negligible; an increase of approximately 228 vehicle trips per day for the ten story alternative in an area already logging over 32,000 trips per day. The reduction of vehicle trips for the nine story alternative is insignificant in relation to air quality measurements. Consequently, the change in air quality due to generation of new traffic associated with the Project will be undetectable. The University will be promoting programs encouraging use of public transportation, car and van pooling. These initiatives are also described in Chapter 14.0, Transportation.

Parking Garage Exhausts

The new School of Management project includes three levels of subsurface parking for both the nine and ten story alternatives. As required by the Massachusetts Building Code (BOCA National Mechanical Code/1987 - Article 16), the parking levels will be supplied with maximum outside air at a rate of 1.5 CFM per square foot. The garage mechanical ventilation systems will have the capacity to provide the equivalent of 10 total air changes of outside air per hour, or one total air change every six minutes.

Air will be mechanically introduced at the south side of each parking level and mechanically exhausted at the north side. The north side exhaust louvers are located approximately 4 to 10 feet off the ground. Three supply and exhaust systems, one for each parking level, will be installed. Locations of garage exhaust louvers are shown in Figure 8-1.

To conserve electrical energy, fans will be sensor controlled to operate only when carbon monoxide (CO) levels exceed threshold levels. The US Environmental Protection Agency recommends a threshold limit of 35 ppm for a 1 hour exposure and a 120 ppm threshold limit for a 15 minute period. Based on these guidelines, ventilation system fans will be off when CO levels are below 35 ppm. When the CO level rises above 35 ppm due to traffic activity inside the garage, ventilation fans will start on low speed. If the CO level rises above 100 ppm, ventilation fans will operate at high speed. High speed operations of the ventilation fans, if necessary, are anticipated only during peak traffic periods in the garage.

Air quality at the garage exhaust louver discharge points is equal to the air quality in the garage. CO levels will fluctuate but will not exceed the EPA thresholds as discussed above. Furthermore, these CO levels are anticipated to drop quickly outside the exhaust louvers due to dispersion of CO in the atmosphere.

8.3 OPERATIONS

Building Exhausts

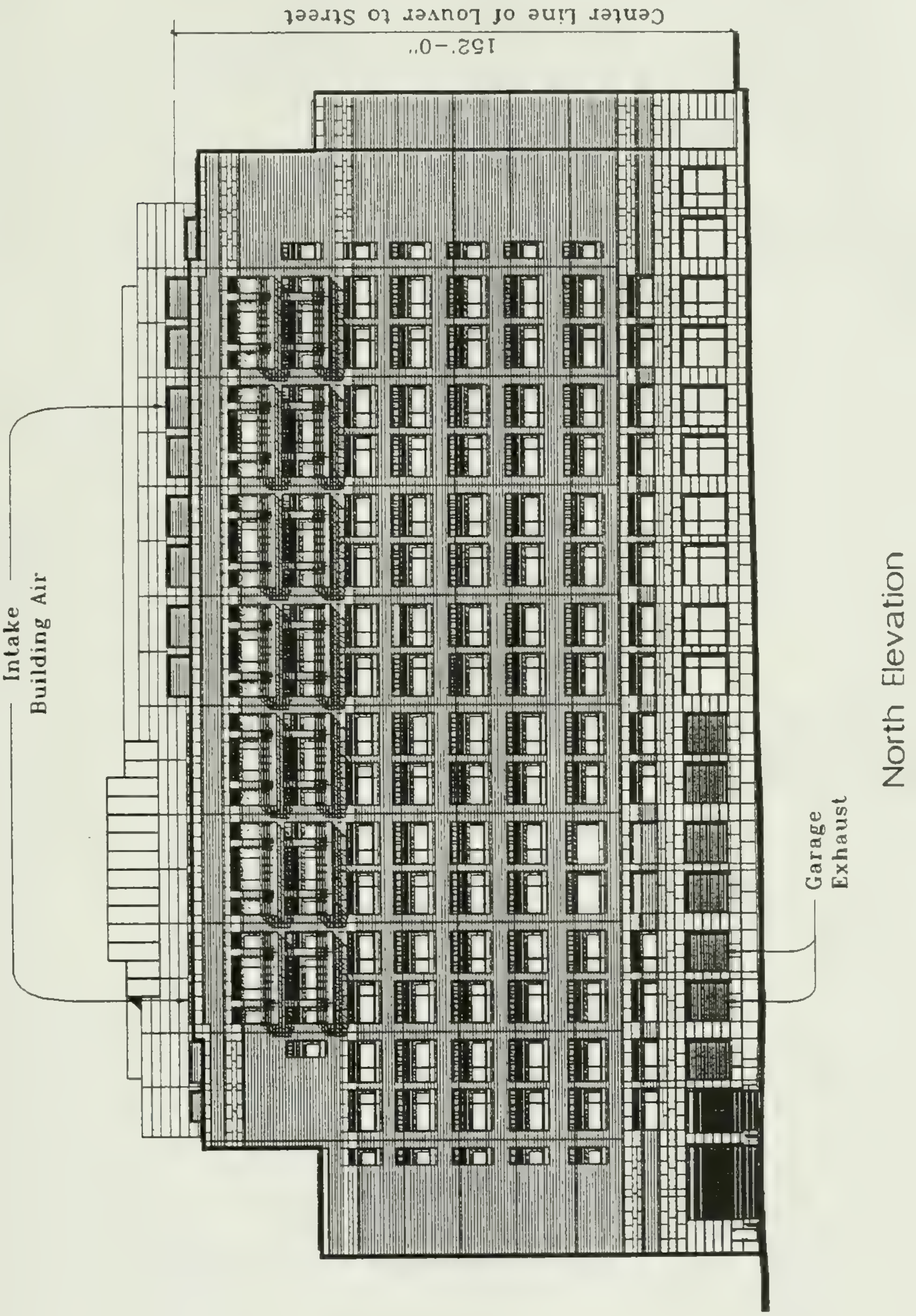
While the ratio of re-circulated air to fresh air requirements is different for classrooms, office space, assembly, etc., the HVAC system proposed for the building will re-circulate an average of about 50% of building air. A portion of the air will be exhausted by direct exhaust systems placed in lounges, toilet rooms, janitors' closets, etc.

The toilet rooms and other exhausts will join the discharged air from the HVAC system and exhaust at the penthouse level. The range hoods will vent vertically to four exhaust fans mounted on the penthouse roof. Consequently, all air will be exhausted at an elevation above 150 feet.

Boiler Exhausts

The heating system proposed for the building will consist of three, 5 million BTU input, dual fuel boilers that will burn either natural gas or #2, low sulfur fuel oil. One unit will serve as a back-up boiler. The boilers will have a thermal efficiency ratio above 80%. The burners are designed to burn at optimum combustion efficiency, drawing combustion air through a forced draft system.

The hot fuel gasses will be vented through three stacks, one for each boiler, extending 5 feet above the penthouse roof. Under 310 CMR 7.02, a permit from the Massachusetts Department of Environmental Protection is required only for stacks exceeding 10 million BTUs. The Project does not exceed this threshold and thus, no permit is required.



Parking Garage Exterior Exhaust Locations

Prepared By: Cannon	**Figure 8-1**

9.0 SOLID AND HAZARDOUS WASTES

9.0 SOLID AND HAZARDOUS WASTES

9.1 INTRODUCTION

Environmental assessments of the new School of Management project site were conducted to assess the potential for the presence of oil and/or hazardous materials at the site. These assessments were based on the review of readily available information on the site history, usage, regulatory status, subsurface soils, observations of ground surface conditions, subsurface field explorations, and chemical testing of soil and groundwater samples. The testing of soil and groundwater samples was performed to assess construction considerations, especially soil and water handling and disposal requirements. The two project alternatives have virtually identical impacts in terms of solid and hazardous wastes.

9.2 EXISTING CONDITIONS

The site is located immediately north of Commonwealth Avenue and west of Kenmore Square. It is currently paved and relatively flat. Ground surface elevations vary from approximately El. 18 to El. 21 (Boston City Base Datum). Two small parking attendant shacks are the only structures currently on the site. The entire site is currently used as a parking area.

9.3 HISTORY OF OIL AND HAZARDOUS MATERIALS

Environmental assessments were conducted by Haley & Aldrich (H&A) in June and December 1992 for Boston University. The purpose of the evaluations was to assess the potential for oil or hazardous materials being present at the site. This evaluation included site history research, regulatory and municipal file reviews, a soil boring and test pit program (see Figure 9-1), and chemical testing of soil and groundwater samples.

Historically, the Project site was a marshy transitional area between upland and flowed tidelands and was one of the last portions of the Back Bay to be filled (see Figure 9-2). The site location was known to be filled in approximately 1890. The site remained undeveloped following the filling until the early 1930's. Additional discussion of the site's history is provided in Chapter 12.0, Historical and Archaeological Resources. The portion of the Project site, formerly occupied by a service station (599-601 Commonwealth Avenue), is currently listed by the Massachusetts Department of Environmental Protection (DEP) as a "Location to be Investigated" (LTBI).

The site is listed as an LTBI due to the presence of gasoline and oil contamination in soil and groundwater in the vicinity of the former service station. The petroleum contamination was initially identified during tank removal activities and previous assessments involving subsurface explorations were conducted between 1983 and 1987 by others.

Remedial response actions were undertaken at the site during the period April 1984 to April 1987. Past remediation included excavation and off-site disposal of contaminated soils in the vicinity of former underground storage tanks which removed a large quantity of the affected soil. In addition, a groundwater depression and scavenger pump system was installed in an attempt to recover phase-separated "free" petroleum product.

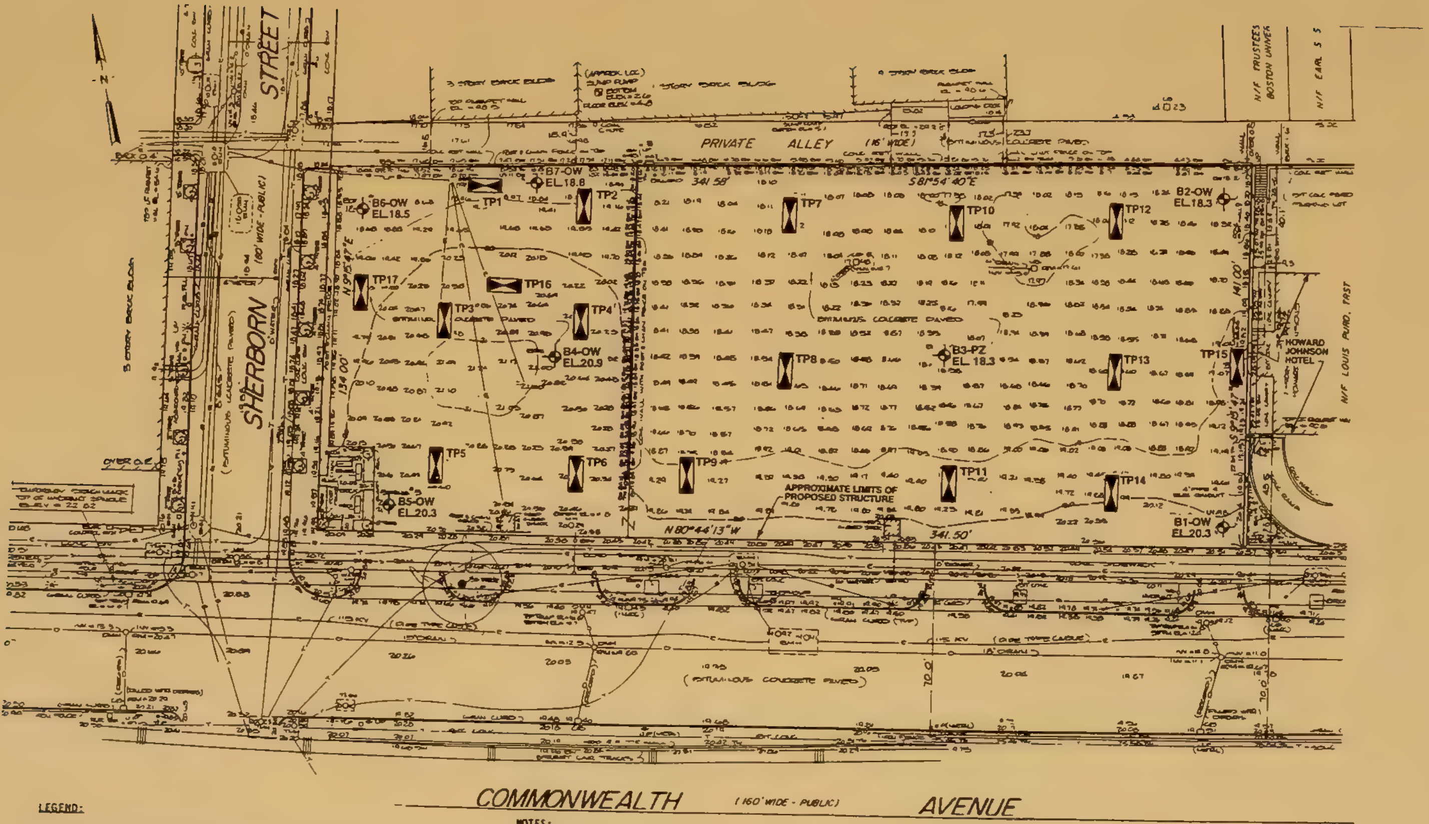
The environmental evaluations conducted by H&A included chemical testing of soil and groundwater samples collected from the borings and/or test pits. The purpose of these tests was to determine the degree and extent of soil contamination within the construction area and to characterize the on-site soils in terms of handling and disposal criteria. Groundwater sampling and analysis was also undertaken to assess the need for treatment during excavation dewatering. The results of these environmental assessments are summarized in Appendix B.

In summary, chemical tests of soil and groundwater conducted in the H&A environmental evaluations indicated that within the western portion of the site, elevated concentrations of total petroleum hydrocarbons are present in the soil and groundwater. This area corresponds to the location of the former service station and underground storage tanks, where remediation excavation and removal were not previously conducted (generally beneath the footprint area of the former station, an area north of the former station, and at the groundwater surface). The soils from the easterly portion of the site showed low levels of total petroleum hydrocarbons and some metals which are typical of urban fill material.

The types and concentrations of compounds detected at the site are consistent with previous site usage and do not constitute an imminent hazard to human health, safety or welfare, or to the environment. No additional sources of contamination were identified at the site. Some areas of the site will require additional evaluation and soil or ground water remediation. It is anticipated that the site remediation would occur during construction of the Project.

9.4 CONSTRUCTION DISPOSAL PLAN

During construction, special handling and proper disposal of contaminated soil materials will be performed. A Disposal Management Plan (DMP) is being developed as part of the construction documents for work at the site. The DMP will outline procedures for on-site classification, handling and testing, and guidelines for the disposal of excavated material during construction. A draft DMP is included in Appendix B. Excavated soils are not planned to be stockpiled on-site, but will be removed and disposed of immediately based on established classification and handling



LEGEND:

B1 EL 20.3	APPROXIMATE LOCATION, GROUND SURFACE ELEVATION AND DESIGNATION OF TEST BORINGS DRILLED BY GUILD DRILLING CO., INC. UNDER THE TECHNICAL OBSERVATION OF HALEY & ALDRICH, INC.
TP-1	APPROXIMATE LOCATION AND DESIGNATION OF TEST PITS COMPLETED BY J. MARCHESE & SONS. INC., UNDER THE TECHNICAL OBSERVATION OF HALEY & ALDRICH, INC., ON 7-8, 11 NOVEMBER 1992.
OW	INDICATES GROUNDWATER OBSERVATION WELL WAS INSTALLED IN THE COMPLETED BOREHOLE
PZ	INDICATES PIEZOMETER WAS INSTALLED IN THE COMPLETED BOREHOLE

NOTES:

1. THIS FIGURE WAS BASED ON A TOPOGRAPHIC SITE PLAN PREPARED BY HARRY R. FELDMAN, INC. DATED 11 FEBRUARY 1992.
2. ELEVATIONS ARE REFERENCED TO BOSTON CITY BASE DATUM (BCB) WHERE EL. 0.0 IS 5.65 FT. BELOW THE 1929 NATIONAL GEODETIC VERTICAL DATUM.
3. LOCATIONS OF BOREHOLES WERE DETERMINED IN THE FIELD BY HALEY & ALDRICH, INC. BY TAPING RELATIVE TO EXISTING SITE FEATURES.
4. ELEVATIONS OF BOREHOLES WERE DETERMINED BY HARRY R. FELDMAN, INC.
5. LIMITS OF TEST PITS ARE NOT TO SCALE.

0 50 100
APPROX. SCALE IN FEET

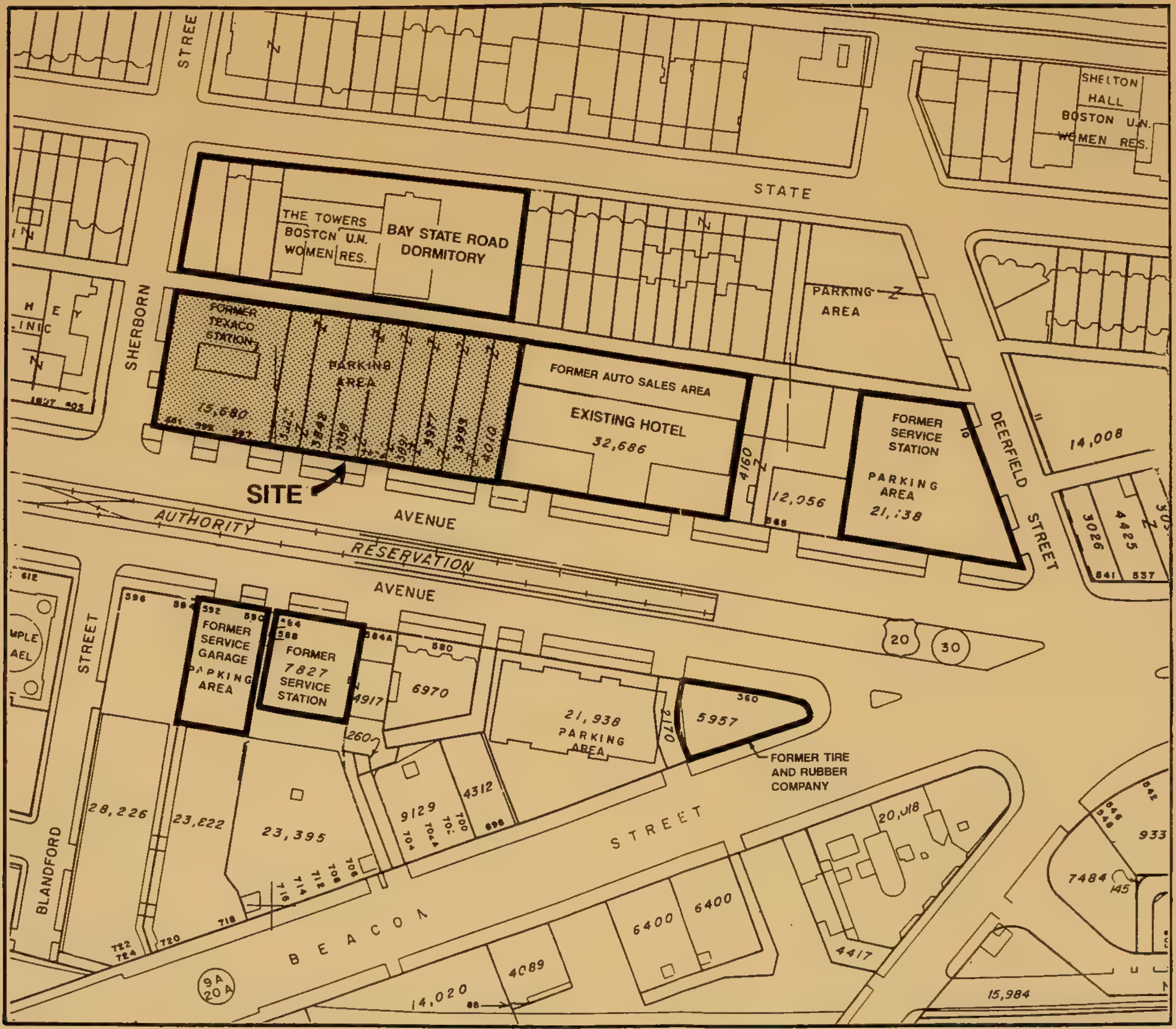
**BOSTON UNIVERSITY
SCHOOL OF MANAGEMENT**

**Subsurface Exploration
Location Plan**

Figure 9-1

Prepared By
Haley & Aldrich

July 1993



BOSTON UNIVERSITY SCHOOL OF MANAGEMENT

Area Features and Historical Locations

Figure 9-2

Prepared By:
Haley & Aldrich
July 1993

NOTE

1 BOSTON REDEVELOPMENT AUTHORITY, CITY OF BOSTON, TOPOGRAPHIC AND PLANIMETRIC SURVEY SHEETS NOS 23N-9E AND 24N-9E, 1961, 1962 WERE USED AS BASE PLAN IN THE PREPARATION OF THIS FIGURE

criteria. Excavated soil will be reused as backfill material to the extent possible to minimize the need for off-site disposal of excess material.

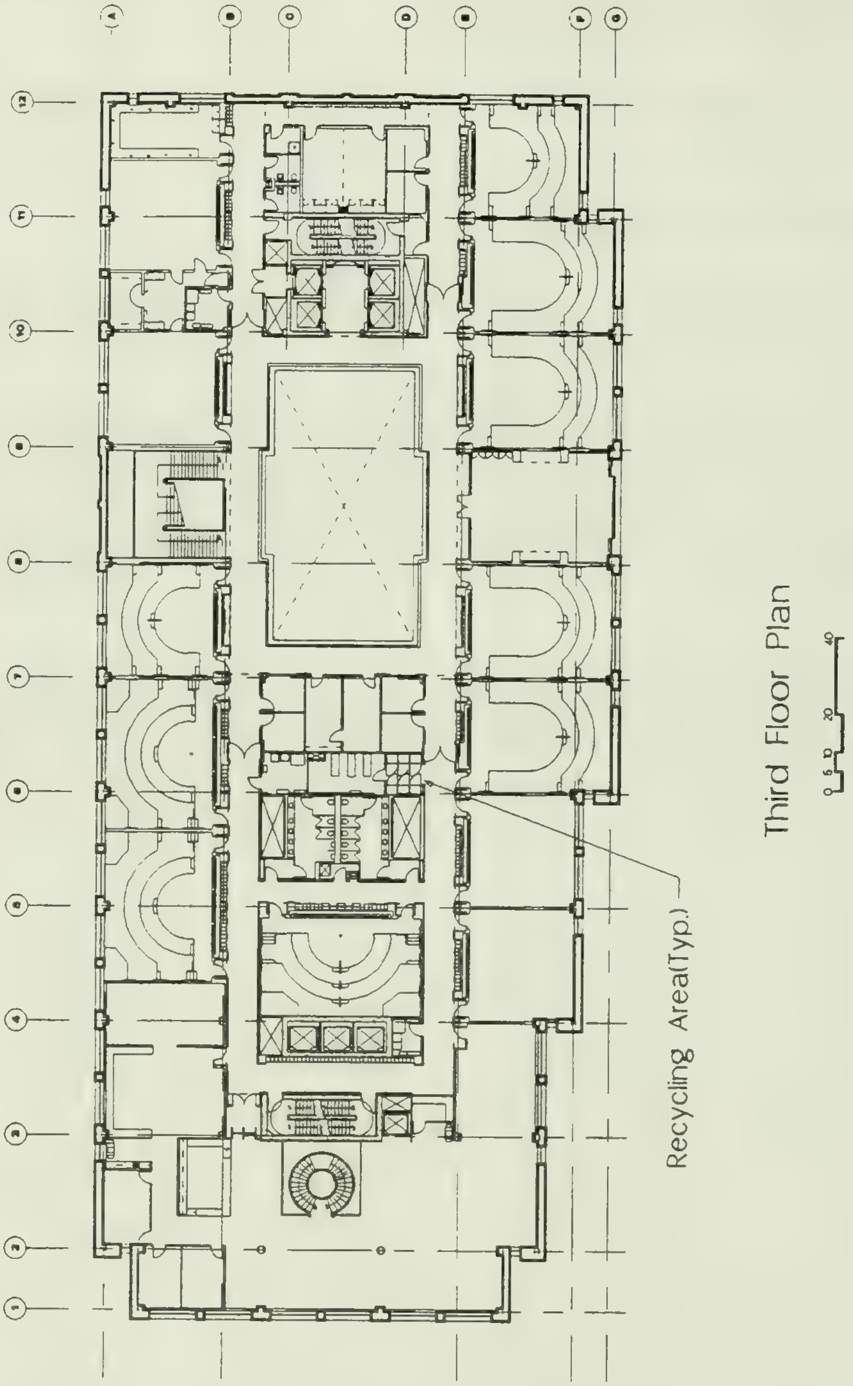
Asphalt from the existing parking lot will be crushed and recycled as part of the site preparation for construction.

9.5 BUILDING OPERATIONS

The new School of Management is designed to accommodate recycling which is instituted by the University throughout the campus.

There will be two methods of waste disposal in the new building to handle standard trash removal (non recyclables) and recyclable materials. A 20 cubic yard trash compactor will be housed in the loading dock of the building. This compactor will store all of the non-recyclable trash coming from the building. The compactor will be emptied as necessary by the contracted service on campus.

One recycling room will be located on each floor. Each room will house six recycling bins for the collection of recyclable materials: paper, newspaper, cans, bottles, plastic and other materials such as Styrofoam cups. These bins will be taken to the loading dock regularly to be handled by the contracted service on campus. Recycling locations are shown in Figure 9-3.



Typical Recycling Area

Prepared By: Cannon

Figure 9-3

10.0 GEOTECHNICAL IMPACTS

10.0 GEOTECHNICAL IMPACTS

10.1 INTRODUCTION

The purpose of this chapter is to summarize subsurface conditions of soils and groundwater at the site and discuss geotechnical-related construction issues. Subsurface conditions and related construction issues are virtually the same in the nine story and ten story alternatives. A groundwater protection plan addressing changes in the water table during construction will be prepared and submitted to the BRA although no significant changes are anticipated. A draft of this plan is found in Appendix B.

The age of a university is measured in terms of centuries and therefore its physical facilities are designed and construction for longevity. Boston University maintains a policy that its buildings achieve a 75 to 100 year life and this is reflected in all aspects of the Project design. Furthermore, as the owner of all the properties abutting the Project site and approximately 80% of Bay State Road properties, the University is concerned about protection of all adjacent structures and utilities before, during, and after construction. These concerns are a primary factor in determining construction techniques. Only construction methods which protect property and promote long-term structural stability were considered for this Project.

10.2 SUBSURFACE SOIL AND GROUNDWATER

Information on subsurface soil and groundwater conditions at the site is available from the following sources:

- Subsurface investigations consisting of seven test borings drilled during December 1991 and January 1992 for foundation design of the Project (see Figure 10-1).
- Subsurface investigations consisting of test pits performed for preliminary environmental investigations in 1992 (See Figure 10-2).

Boring Results

Seven test borings monitored by H & A indicate that the subsurface conditions at the site consist of the following generalized strata, from ground surface downward (see Figure 10-2).

Miscellaneous Fill - The fill ranges in thickness from approximately 8.5 feet to 14 feet at the test boring locations. The fill typically consists of fine sand, with varying amounts of coarse to medium sand, silt, gravel, and miscellaneous materials.

Organic Soil - Organic soils, consisting of soft to medium stiff organic silt with varying amounts of fine sand, seashells, and fibrous roots encountered. The thickness of this unit ranged from 8.8 feet to 10.5 feet.

Marine Sand - The marine sand unit ranged in thickness from approximately 10.5 feet to 20.7 feet. The deposit ranges in gradation from very dense to dense, gray, coarse to fine sand, with varying amounts of silt, gravel, and cobbles; to very dense to dense, silty fine sand and fine sandy silt, with varying amounts of coarse to medium sand, gravel and cobbles.

Marine Clay - The top of the clay stratum varies from approximately El. -14.2 to El. -23.2 (BCB Datum). The thickness of the clay was 128 feet where fully penetrated. This unit consists of hard to very soft, gray, laminated silt and clay; to silty clay, with partings to pockets of silt and fine sand.

Glaciomarine - The glaciomarine deposit consists of very stiff, gray, laminated silty clay to clayey silt, with a trace of coarse to fine sand. This unit was encountered below the clay stratum, approximately 163 feet below grade and the thickness was approximately 5.5 feet.

Glacial Till - Glacial till was encountered at 168.5 feet depth below grade and was approximately 2.5 feet thick. The glacial till consisted of a very dense, heterogeneous mixture of gravel sand, silt and clay.

Bedrock - The bedrock encountered at the site is known locally as Cambridge Argillite. The bedrock was encountered at 171 feet below existing ground surface.

Groundwater

The groundwater level in the observation wells installed in the recent borings ranged from 6 feet to 12.5 feet below ground surface during the period from December 27, 1991, to February 11, 1992. Water level variations may be encountered during construction since groundwater levels are influenced by precipitation, local construction activities, and leakage in and out of sewers and storm drains, if any.

10.3 CONSTRUCTION

Three levels of below-grade parking are planned for the new School of Management building for both the nine and ten story alternatives. The foundation walls and foundation mat will consist of reinforced concrete. The Project will be supported by a reinforced concrete mat foundation bearing in the marine sand and/or clay soils. The anticipated foundation bearing level is approximately 40 feet below existing site grade (El. -20).

The mat will be designed as a compensating foundation to ensure that long-term post-construction settlements will be negligible. There will not be a permanent foundation underdrain. Therefore, long-term groundwater levels will remain unchanged after building construction.

The excavation for building construction will require a temporary excavation support system, and temporary dewatering within the limits of this support system.

The excavation support wall is planned to consist of continuous, interlocking, steel sheetpiles that will be installed along with excavation perimeter. The sheeting is a relatively impermeable, temporary, support wall that was selected, in part, to maintain the surrounding groundwater levels during construction. This sheeting is currently planned to be laterally braced by tiebacks.

Limited temporary dewatering will be conducted as necessary within the limits of the continuous excavation support wall to permit foundation construction in-the-dry. The steel sheeting used as the excavation support wall will extend from the ground surface down into the clay deposit located at, and below, the bottom of the excavation to prevent groundwater seepage below the support wall.

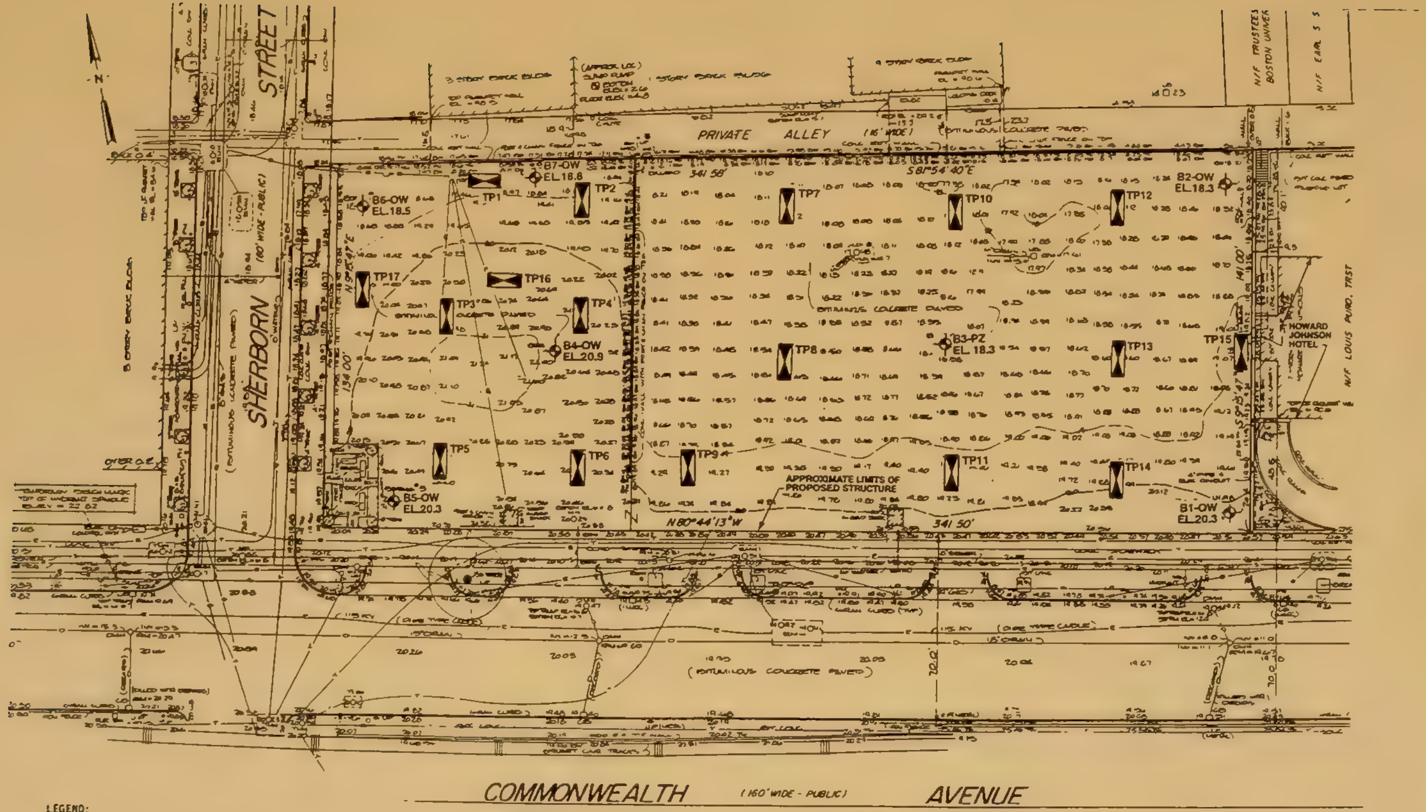
A geotechnical instrumentation program will be conducted during construction to monitor the performance of the construction activities. This program will include observation wells and piezometers installed outside the limits of the excavation to monitor groundwater levels during construction. If monitoring indicates the groundwater levels are lowered as a result of the construction, remedial measures will be implemented during construction. Remedial measures might include sealing leaking sheetpiles and/or recharging the groundwater level outside the excavation limits. The type and extent of a recharge system, if necessary, will depend upon the magnitude of groundwater drawdown outside the site limits. A groundwater protection plan addressing any changes in the water table which might occur during construction of the Project will be prepared for review by the BRA. A draft of this plan is found in Appendix B.

An alternative excavation support system is currently being investigated for the Project construction. This proprietary system would involve a soil mix wall system similar to the system employed by the Central Artery/Tunnel project in East Boston.

Groundwater quality monitoring and discharge during construction will be conducted in accordance with the requirements of the BWSC permit. The average temporary discharge rate during construction is estimated to vary between 5 and 50 gallons per minute. Significantly less discharge volume is anticipated after excavation to foundation level is completed. Additional Construction impacts are discussed in Chapter 11.0.

10.4 FACILITIES WITHIN OR NEAR THE SITE

The proposed excavation and subsurface construction methods are not anticipated to adversely effect adjacent streets, utilities and existing structures. The excavation support system will be designed to protect existing improvements such as buildings, streets, and utilities. The Boston University dormitory and other buildings located on the north side of the private alley that abuts the site and the building located on the west side of Sherborn Street are located outside the zone of influence of the excavation. The excavation support system on the east side of the site will be designed to reduce soil displacements to the extent possible in order to reduce construction effects on the University-owned Howard Johnson's Motor Lodge adjacent to the site.



LEGEND:

B1 EL 20.3	APPROXIMATE LOCATION, GROUND SURFACE ELEVATION AND DESIGNATION OF TEST BORINGS DRILLED BY GUILD DRILLING CO., INC. UNDER THE TECHNICAL OBSERVATION OF HALEY & ALDRICH, INC.
TP-1	APPROXIMATE LOCATION AND DESIGNATION OF TEST PITS COMPLETED BY J. MARCHESE & SONS, INC., UNDER THE TECHNICAL OBSERVATION OF HALEY & ALDRICH, INC., ON 7-8, 11 NOVEMBER 1992.
OW	INDICATES GROUNDWATER OBSERVATION WELL WAS INSTALLED IN THE COMPLETED BOREHOLE
PZ	INDICATES PIEZOMETER WAS INSTALLED IN THE COMPLETED BOREHOLE

NOTES:

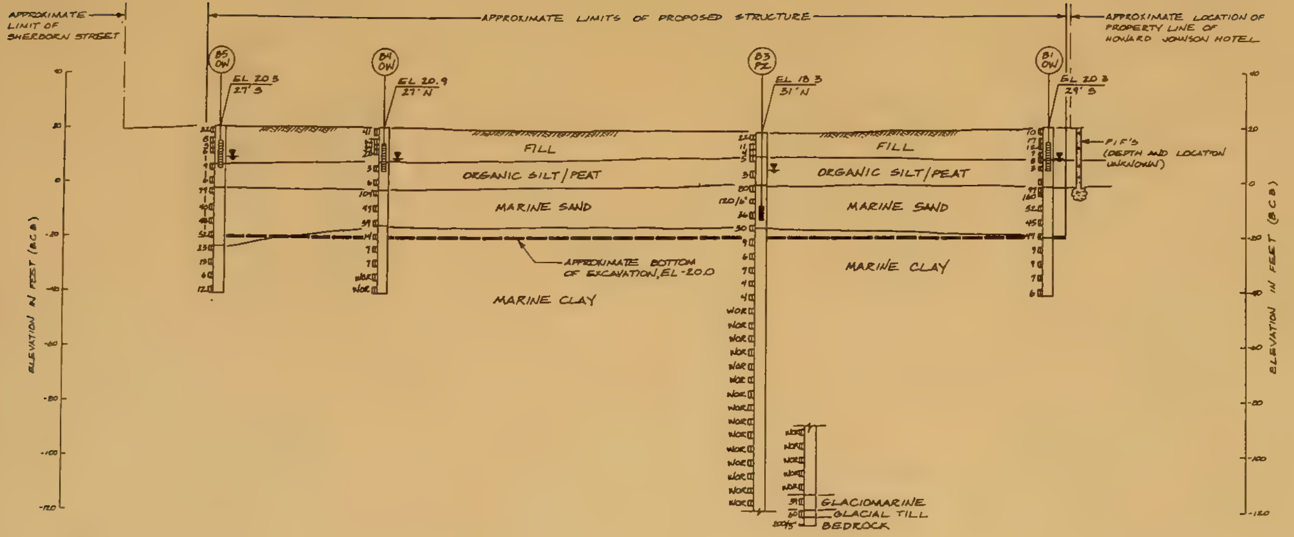
1. THIS FIGURE WAS BASED ON A TOPOGRAPHIC SITE PLAN PREPARED BY HARRY R. FELDMAN, INC. DATED 11 FEBRUARY 1992.
2. ELEVATIONS ARE REFERENCED TO BOSTON CITY BASE DATUM (BCB) WHERE EL. 0.0 IS 5.65 FT. BELOW THE 1929 NATIONAL GEODETIC VERTICAL DATUM.
3. LOCATIONS OF BOREHOLES WERE DETERMINED IN THE FIELD BY HALEY & ALDRICH, INC. BY TAPING RELATIVE TO EXISTING SITE FEATURES.
4. ELEVATIONS OF BOREHOLES WERE DETERMINED BY HARRY R. FELDMAN, INC.
5. LIMITS OF TEST PITS ARE NOT TO SCALE.

BOSTON UNIVERSITY SCHOOL OF MANAGEMENT

Subsurface Exploration Location Plan

Figure 10-1

Prepared By:
Haley & Aldrich
July 1993


APPROXIMATE LIMIT OF SHERBORN STREET
APPROXIMATE LIMITS OF PROPOSED STRUCTURE
APPROXIMATE LOCATION OF PROPERTY LINE OF HOWARD JOHNSON HOTEL
B5 OW
EL 20.5
27' S
B4 OW
EL 20.9
27' N
B3 PZ
EL 18.3
31' N
B1 OW
EL 20.3
29' S
FILL
ORGANIC SILT/PEAT
MARINE SAND
MARINE CLAY
APPROXIMATE BOTTOM OF EXCAVATION, EL -20.0
P.I.F.'S (DEPTH AND LOCATION UNKNOWN)
GLACIOMARINE
GLACIAL TILL
BEDROCK
ELEVATION IN FEET (BCB)
40
20
0
-20
-40
-60
-80
-100
-120

LEGEND

BORING DESIGNATION

OW INDICATES GROUNDWATER OBSERVATION WELL INSTALLED IN COMPLETED BOREHOLE, PZ INDICATES PIEZOMETER WAS INSTALLED.

APPROXIMATE GROUND SURFACE ELEVATION (BOSTON CITY BASE DATUM)
BOREHOLE OFFSET DISTANCE FROM PROFILE LINE.

GROUNDWATER OBSERVED IN OBSERVATION WELL OR PIEZOMETER ON 2/11/92 (REFER TO APPENDIX B FOR OBSERVATION WELL AND PIEZOMETER READINGS)

LOCATION OF OBSERVATION WELL INSTALLED IN COMPLETED BOREHOLE (REFER TO APPENDIX B FOR OBSERVATION WELL INSTALLATION REPORTS).

LOCATION OF PIEZOMETER INSTALLED IN COMPLETED BOREHOLE (REFER TO APPENDIX B FOR PIEZOMETER INSTALLATION REPORTS).

LOCATION OF 2-IN O.D. SPLIT-SPOON SAMPLE DRIVEN WITH 140-LB HAMMER, 30-IN. DROP: NUMBER INDICATES PENETRATION VALUE, IN BLOWS PER FOOT, UNLESS OTHERWISE NOTED

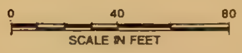
STRATIFICATION LINE BETWEEN SUBSURFACE UNITS

BOTTOM OF EXPLORATION

UNIT	DESCRIPTION
MISCELLANEOUS FILL	LOOSE TO MEDIUM DENSE, GRAY TO BROWN FINE SAND, WITH VARYING AMOUNTS OF COARSE TO MEDIUM FINE GRAVEL, SILT, ASH, CINDERS, BRICKS AND CONCRETE.
ORGANIC SILT/PEAT	MEDIUM STIFF TO SOFT, GRAY ORGANIC SILT, WITH VARYING AMOUNTS OF FINE SAND, SEASHELLS, FIBROUS ROOTS.
MARINE SAND	VERY DENSE TO DENSE, GRAY, COARSE TO FINE SAND, WITH VARYING AMOUNTS OF SILT AND GRAVEL AND COBBLES; TO VERY DENSE TO DENSE, GRAY SILTY FINE SAND TO FINE SANDY SILT, WITH VARYING AMOUNTS OF COARSE TO FINE SAND, GRAVEL, AND COBBLES.
MARINE CLAY	HARD TO VERY SOFT, GRAY LAMINATED SILT AND CLAY TO SILTY CLAY, WITH PARTINGS TO POCKETS OF SILT AND FINE SAND.
GLACIOMARINE	VERY STIFF, GRAY LAMINATED SILTY CLAY TO CLAYEY SILT, TRACE COARSE TO FINE SAND
GLACIAL TILL	VERY DENSE HETEROGENEOUS MIXTURE OF GRAVEL, SAND, SILT AND CLAY
BEDROCK	VERY DENSE, GRAY, DECOMPOSED ARGILLITE

NOTES:

1. SUBSURFACE STRATIFICATION LINES BETWEEN BORINGS ARE INTERPOLATIONS AND MAY NOT NECESSARILY AGREE WITH ACTUAL FIELD CONDITIONS.
2. ELEVATIONS ARE IN FEET AND ARE REFERENCED TO BOSTON CITY BASE DATUM (BCB).
3. REFER TO TEXT, TABLES AND APPENDICES FOR DESCRIPTION OF SOIL AND ROCK SAMPLES RECOVERED.
4. THE LIMITS OF THE STRUCTURES INDICATE THE APPROXIMATE OUTSIDE LIMITS AND APPROXIMATE BOTTOM OF EXCAVATION ELEVATION.



**BOSTON UNIVERSITY
SCHOOL OF MANAGEMENT**

Subsurface Profile

Figure 10-2

Prepared By:
Haley & Aldrich

July 1993

11.0 CONSTRUCTION

11.0 CONSTRUCTION IMPACTS

11.1 INTRODUCTION

This chapter addresses issues relating to the actual construction process for the Boston University new School of Management project such as scheduling, staging areas, traffic, air and water quality, noise, excavation, and rodent control. Mitigation measures are also identified as appropriate. Construction impacts are not anticipated to be unusual. Careful compliance with City of Boston regulations and approved construction management documents will provide adequate mitigation of potential construction impacts.

A number of documents will be prepared which detail how construction issues will be handled and potential impacts mitigated. These documents will include the Construction Management Plan, the Disposal Management Plan, and the Integrated Pest Management Plan. A plan addressing changes in the water table during and after construction will also be prepared and submitted to the BRA.

The nine and ten story project alternatives do not create significant differences in construction impacts. Where there are differences, they are discussed, otherwise the impacts are anticipated to be the same.

11.2 SCHEDULE AND HOURS

Construction is currently scheduled to commence in the spring of 1994 and be completed in the fall of 1996. Typically, construction takes place on weekdays between the hours of 7:00 AM and 3:30 PM. Construction hours for the Project may vary. If the need for overtime and/or weekend work hours arises, this will be pre-scheduled in order to avoid conflicts, and appropriate permits will be acquired. The nine story project will require a slightly shorter construction period than the ten story alternative.

Scheduling of materials being delivered to and taken from the site by truck may have a significant affect on traffic. Commonwealth Avenue is a major commuting artery to and from downtown Boston and Kenmore Square. Construction activities will be scheduled to avoid local traffic conflicts as much as possible and will be specified in the Construction Management Plan.

11.3 EXISTING PARKING

The Project site is currently utilized as an employee parking lot for 181 cars. The lot is full during the day, but is relatively empty after work hours, except when it is used as paid parking for evening Red Sox games.

These 181 parking stalls, along with another dozen or so metered spaces on Commonwealth Avenue, will be temporarily eliminated during construction. The University is in the process of identifying on-campus replacement parking during construction. The University controls a number of convenient lots which can handle the displacement. Chapter 14.0, Transportation, further discusses existing parking conditions and campus-wide parking facilities.

11.4 PUBLIC SAFETY AND PEDESTRIAN ACCESS

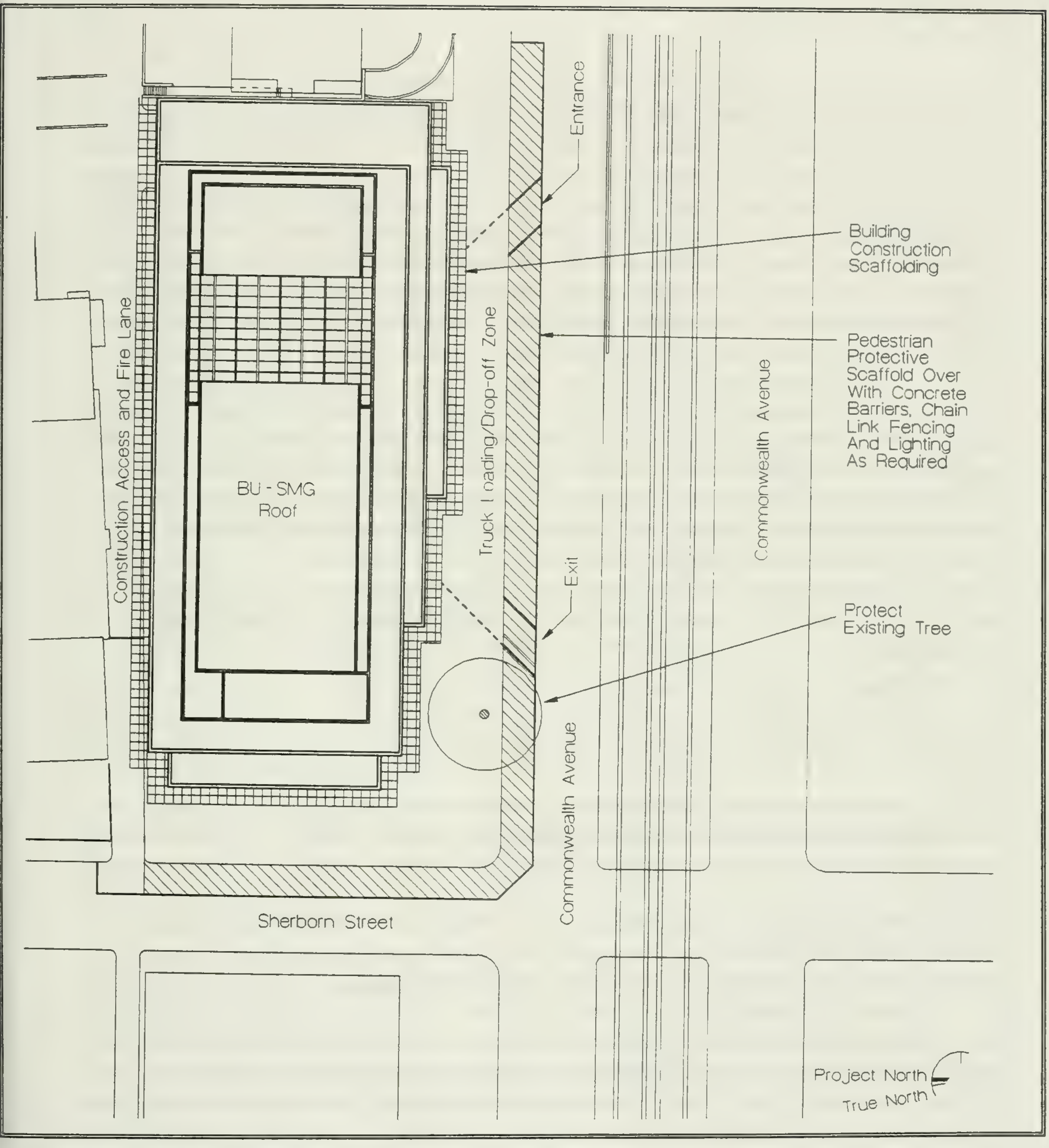
No disruption to pedestrian traffic along the west side of Sherborn Street (across from the Project site) is anticipated. However, in order to maximize on-site materials storage and construction staging, it is proposed that the construction site include adjacent sidewalks along Commonwealth Avenue and the east side of Sherborn Street along the Project site. Pedestrian traffic in these locations will be re-routed through marked, covered, lit, and barricaded pedestrian walkways (see Figure 11-1).

During non-construction hours, construction site security will be maintained by utilizing the University's campus security forces.

11.5 TRAFFIC

As much as possible, vehicular access to the adjacent properties will be maintained at all times during construction. If it is necessary for Sherborn Street or the alley bordering the north boundary of the site to be blocked during construction, a traffic control officer will be assigned to direct traffic. Any blocking of streets is required to be scheduled and permitted in advance, and signs must be posted to alert the public.

Construction truck traffic will be limited principally to Commonwealth Avenue and will be prohibited from Bay State Road entirely. During times when truck traffic is heavy, mostly during the early phases of construction, special traffic control procedures will be provided. To the extent practical, the number of trucks will be minimized. The private alley located to the rear of the site will remain open for fire truck access and vehicles servicing the dormitory. If the alley is closed, appropriate traffic controls will be provided and notice will be given as described above. In order to keep such events to the minimum, a platform spanning the alley will be erected so that scaffolding for workers can then be erected on the platform. Details of truck and general traffic control will be included in the Construction Management Plan.


Entrance
Building Construction Scaffolding
Pedestrian Protective Scaffold Over With Concrete Barriers, Chain Link Fencing And Lighting As Required
Construction Access and Fire Lane
Truck Loading/Drop-off Zone
BU - SMG Roof
Commonwealth Avenue
Exit
Protect Existing Tree
Commonwealth Avenue
Sherborn Street
Project North
True North

Access and Pedestrian Protection Plan

Prepared By: Cannon

Figure 11-1

11.6 STAGING AREAS AND WORKER PARKING

The Project site has limited construction staging capacity similar to other construction sites in the city. Including the sidewalks along Sherborn Street and Commonwealth Avenue, but excluding the building footprint, there will be approximately 16,000 square feet enclosed within the construction fence. Subtracting the area required for scaffolding and truck unloading, only several thousand square feet remain. Therefore, additional staging areas will be required off-site. It is proposed to use the undeveloped parcel in front of 620 Commonwealth Avenue for staging. This site has been previously used for staging of other construction projects.

The average work force on-site during the construction period is expected to be approximately 75 per day, with a peak of approximately 100 to 120, including construction workers, architects, and engineers. As per City of Boston requirements, it is assumed that 50% of the workers will be Boston residents and, because of the site's excellent accessibility via public transportation, a large number of these workers will commute via public transit. To help achieve this goal, the University will subsidize construction worker MBTA passes for the duration of the construction period. Parking options for the remainder of the work force are under study. Sites under consideration include lots controlled by the University and local commercial lots offering long-term parking within a 1/3 mile radius. The Construction Management Plan will include a worker parking plan.

11.7 AIR QUALITY AND DUST CONTROL

The generation of potential air emissions during construction of the new School of Management project is expected to be minimal. Principally, emissions will be comprised of fugitive dust and exhaust gases from construction equipment.

Construction equipment will be maintained in good working order so as to maximize engine efficiency and reduce the emission of pollutants. Details of air quality control measures associated with construction will be included in the Construction Management Plan.

Fugitive dust will be controlled by means of the periodic application of environmentally benign wetting agents. Further, as soon as practicable, all exposed areas either will be temporarily stabilized (through the use of straw or jute matting, for example) or permanently landscaped.

In order to reduce dust and debris in the surrounding area, only licensed commercial haulers using covered trucks will be used to remove construction debris. Nonetheless, sweeper trucks will clean the surfaces of Commonwealth Avenue and Sherborn Street every evening. Existing asphalt on the site will be removed and recycled as part of site preparation for construction.

11.8 WATER QUALITY

For construction of the Project, dewatering permits will be required from the Boston Water and Sewer Commission (BWSC). Special requirements of these permits will be included in the Contract Documents, as appropriate.

During construction of the Project, there will be a negligible effect on water quality in the area. The stormwater and groundwater that collects within the excavation support walls, roughly 7/8ths the area of the existing parking lot, will be collected and, if necessary, treated in accordance with the requirements of the BWSC permit prior to discharge into the stormwater system in Commonwealth Avenue. After the foundation is in place and backfilling is completed, stormwater will continue to discharge into the drainage system designed for the finished building.

Preliminary calculations indicate dewatering of from 5 to 50 GPM during construction. During the temporary construction dewatering process, water will be separated and treated before being discharged into the storm drain in Commonwealth Avenue. The details of how this water will be processed will be in conformance with the BWSC permit and will be included in the Construction Documents.

11.9 NOISE AND VIBRATION

The University, as the owner of the majority of adjacent residential, commercial and academic buildings housing its workers, staff and students, is especially concerned about the need to minimize noise associated with construction.

The Project is in an urban area with high ambient noise levels. Sensitive receptors in the immediate vicinity of the Project site include the Boston University dormitory, University and private residences on Bay State Road, and the Howard Johnson's Motor Lodge adjacent to the site.

All construction work at the site must be performed in accordance with the Regulations for Control of Noise in the City of Boston. In addition, the Construction Management Plan will include criteria for construction noise and vibration, particularly during sensitive hours and for noise sensitive abutters. It will stipulate protocols to be followed by the contractors in order to manage noise at the Project site. Among other things, it will define construction hours, truck routes, procedures such as the periodic inspection of mufflers to ensure their proper operating condition, and procedures for monitoring vibration. Particular emphasis will be given to the control of noise and vibration during the site preparation and excavation phases.

Foundation construction will employ techniques which will minimize noise and vibration, with particular attention to potential impacts on the adjacent residences and the Howard Johnson's

Motor Lodge. Slurry walls or sheet piling installed with a vibrating hammer are the alternative temporary excavation support systems under consideration. No blasting or impact pile driving is anticipated to be necessary.

To the extent practicable, the staging of construction equipment at the site will be undertaken with consideration for potential noise impact on adjacent land uses. Compressors, pumps, and similar pieces of equipment, which remain relatively stationary throughout the construction period, will be located away from residential uses and other sensitive receptors to the extent possible.

11.10 GEOTECHNICAL IMPACTS

Foundation

The new School of Management will be supported by a reinforced concrete mat foundation approximately 5 feet thick. Three levels of below grade parking are proposed. A discussion of potential adverse effects from this type of foundation construction and protective measures are covered in the following paragraphs. Further discussion of foundation design is found in Chapter 10.0, Geotechnical Impacts.

Groundwater Protection

While permanent underdrains and sump pumps in nearby buildings may have a localized impact, the ground water supply in the general area of the Project is believed to be primarily affected by the Charles River, the Massachusetts Turnpike underdrains, precipitation, and water from utility lines and trenches. Initial field work indicates that the first appearance of groundwater on the site is roughly between 6 feet and 12 feet below grade. Accordingly, temporary dewatering inside the excavation limits will be necessary.

To permit construction of the foundation "in-the-dry", operation of pumps inside the excavation will be required. Effluent from this pumping will be discharged to the City of Boston's stormwater collection system in accordance with the BWSC permit (see Section 11.8).

To protect adjacent properties, a relatively impervious excavation support wall (e.g. continuous interlocking steel sheeting) will be installed around the excavation site. This will minimize the lowering of off-site groundwater levels until the foundations are backfilled. A geotechnical instrumentation program will be conducted during construction to monitor the performance of construction activities. This program will include observation wells and piezometers installed outside the limits of the excavation to monitor groundwater levels. If monitoring indicates that the groundwater levels are lowered as a result of the construction, remedial measures will be implemented, such as sealing leaking sheetpiles and/or recharging the groundwater level outside the excavation limits. The type and extent of a recharge system, if necessary, will depend upon the magnitude of groundwater drawdown outside the site limits. A soil mix wall option is being considered which is similar to the system employed in the Central Artery/Tunnel project in East Boston. A Groundwater Protection Plan addressing changes in the water table during and after construction will be submitted to the BRA. A draft plan can be found in Appendix B. Further discussion of foundation construction and groundwater protection can be found in Chapter 10.0, Geotechnical Impacts.

Existing Utilities

No adverse impact to the surrounding utilities is expected during construction. Street openings will be typical for construction projects of this size. Excavation will be within property lines, and the temporary excavation support wall will prevent movement of utilities in adjacent streets and ways. Careful coordination with the City, public, and private utility companies will be employed to avoid unnecessary disruption in service.

11.11 EXCAVATED MATERIAL

During construction, a conventional temporary excavation support system will be installed along the perimeter of the excavation. It will consist of a continuous wall that extends the complete depth and length of the excavation. As excavation proceeds, bracing will be installed in order to provide lateral support. This system will support the adjacent streets, structures, and other existing improvements.

The proposed construction calls for excavation to a depth of 40 feet. It is estimated that a total of approximately 16,000 cubic yards of material will be excavated, all of which will be promptly removed from the site and disposed of in accordance with state regulations.

The portion of the site formerly occupied by the gas station (599-601 Commonwealth Avenue) is currently listed by DEP as a "Location to Be Investigated" (see Chapter 9.0, Solid and Hazardous Waste). In the spring of 1987, all the known underground fuel tanks and approximately 3,676 cubic yards of soil contaminated with petroleum products were removed from this area. Clean fill was placed in the void.

Analysis of samples taken from test borings, test pits, and observation wells installed on the site in the winter of 1992 indicate low levels of petroleum/oil still in the soil and groundwater in localized areas. The concentrations of these contaminants are consistent with previous site usage and do not constitute an imminent hazard to health or the environment. However, the contaminated soil will require special disposal. Accordingly, a Disposal Management Plan (DMP) will be developed and included in the Contract Documents. A draft DMP is in Appendix B.

Among other things, this document will specify procedures meeting state and federal guidelines for classification, handling, testing, and disposal of the tainted excavated material.

11.12 RODENT CONTROL

Norway rats (Ratus norvegicus) and house mice (Mus musculus), the rodents most common to the Boston area, generally inhabit surface and subsurface areas around available food sites. Construction activities disturb these habitats by eliminating food, shelter, and movement routes.

At construction sites where existing buildings must be demolished, rodents can be a serious problem. Since there are no structures on the site for the Boston University new School of Management on Commonwealth Avenue, the proposed construction is not expected to pose any serious threat of increased pest activity in the vicinity.

An Integrated Pest Management Plan, coordinated with the current Boston University campus program will be established prior to construction. This plan will detail measures to be taken that will reduce the rodent population prior to construction, and will include measures that address sanitation, rodent proofing, and poison baiting.

Licensed pest control professionals using registered rodenticides will undertake poison baiting prior to construction and at regular intervals during construction. Public education and strict monitoring of the poisons used is expected to reduce the chances of harm to people and pets. In addition, daily inspections and treatment of rodent habitats in the construction area and on adjacent properties will be conducted throughout the construction period. This will include the monitoring of rodent movement in areas of special concern such as the adjacent dormitory and Howard Johnson's Motor Lodge sites.

12.0 HISTORICAL AND ARCHAEOLOGICAL IMPACTS

12.0 HISTORIC/ARCHAEOLOGICAL RESOURCES

12.1 INTRODUCTION

This chapter contains an assessment of historic and archaeological resources at and near the new School of Management site. A full analysis of potential impacts on the adjacent Bay State Road/Back Bay West Architectural Conservation District (the District) is provided. The original project proposed a ten story building. Largely in response to concerns expressed about potential impacts on this adjacent historic district, a reduced nine story project alternative has been developed. Where there are significant differences in impacts, both the nine and ten story project alternatives are discussed.

This chapter is also intended to assist the Massachusetts Historical Commission in their regulatory review of the Project. Furthermore, an archaeological reconnaissance of the site is summarized in this chapter. It is recognized that the Project is subject to MGL, Ch. 9, Section 26-27c as amended by Ch. 254 of the Acts of 1988.

12.2 HISTORIC BACKGROUND

The following section provides a brief description of the history of the Project site and other historic resources in the area, including the adjacent historic district. The new School of Management project site is not located in a historic district. However, the Project site is adjacent to the District, which is designated as a local landmark and listed on the State Register of Historic Places, and near the Charles River Basin Historic District.

Site History

Background research indicates that the Project site was formerly an area of salt marshes and mud flats adjacent to the Charles River and was filled in the late 1800's as part of the development of the Back Bay. There is no record of occupancy or use of the Project site until 1926, when a billboard structure was known to be located on the site. This was removed in 1927. The eastern portion of the site was used as a parking lot for the Lahey Clinic, established in the mid 1920s on Bay State Road. It was reported that a "Brown's Dining Car" was parked at the corner of Sherborn Street and Commonwealth Avenue in 1928. The site was vacant from 1931 until 1935, when a two story single family brick building was erected at 597 Commonwealth Avenue. In 1937, a "Texas Company" service station was built at 601 Commonwealth Avenue. In 1954, this facility was razed and replaced with a new service station which included a three car garage. In

1987, the service station was razed and replaced with surface parking. (Site remediation activities related to the gas station removal are discussed in Chapter 9.0, Solid and Hazardous Materials.)

Bay State Road

Bay State Road was developed principally between 1890 and 1915 with townhouses and mansions; and later with apartment buildings. The popularity of the street was short-lived, however, and by the 1920s it had lost developer and owner interest to the expanding suburbs. It was during this period when Boston University first acquired land along Bay State Road in preparation for the establishment of the Charles River Campus. A decade later, luxury apartment hotels, such as the Myles Standish and Sheraton, filled vacant spaces. Bay State Road also flourished with attractive homes and doctors' offices including the Joslin and Lahey Clinics.

After World War II, the suburbs boomed and the demand for city townhouses dramatically declined. Boston University acquired additional land and buildings in the area which have become integral to the University's Charles River Campus. The University used these-historic buildings along Bay State Road to serve residential and academic needs of the institution.

In 1979, the Bay State Road/Back Bay West Architectural Conservation District was designated by the Boston Landmarks Commission under Chapter 722 of the Acts of 1975. The District was created in recognition of the architecturally and historically significant buildings along Bay State Road and the Back Bay West area. By virtue of this designation, the District is a State Register property.

The original investigation of the area targeted only Bay State Road, but the study was expanded to include sections of Commonwealth Avenue, Newbury and Beacon Streets and the Kenmore Square commercial area. The final District boundary, as shown in Figure 12-1, reflects the cohesive streetscape, architecturally significant houses and historically significant buildings key to the history of the area. The Kenmore Square area and Commonwealth Avenue to the west of Kenmore Square were excluded from the District because the commercial architecture predominant in these areas was not generally of the same developmental framework and its character was recognized as entirely different from that of Bay State Road.

The District contains about thirty acres of land including close to 200 buildings. These buildings are predominantly brick three to five story townhouses most of which were constructed between 1890-1914. Architectural styles reflect a range of Authentic Revivals including McKim Classical, Renaissance, Georgian, Federal, and Tudor Revivals. The great majority of buildings are in good to excellent condition due to the pride and concern of the property owners, including Boston University. As it did in the past, the University continues to dedicate considerable money and resources toward restoration and maintenance of this area.

Presently, the University owns and occupies the vast majority of buildings along Bay State Road comprising over one million square feet of space, and works vigorously to maintain their historic character. To enhance the historic area, the University created the George Hart Way and Warren Alpert Mall along Bay State Road, and has implemented an extensive landscaping and maintenance program. Recently, at the urging of the University, New England Telephone has buried unsightly phone lines underground along Bay State Road.

The University implements a comprehensive maintenance program for Bay State Road which includes street cleaning, power sweeping, snow removal, trash and poster removal, a landscaping program, and pest control. The University has also worked closely with the Boston Landmarks Commission staff to enhance the historic character of the exterior of the buildings by removing paint, restoring historic facades, and installing period doors. The University has also restored the interiors of many buildings with period furniture and fixtures. These improvements represent a substantial financial investment by the University in support of the historic character of the area. Boston University continues to pursue long and short range enhancements of the District.

Other Historic Sites in the Area

Other historic areas and landmarks located near the Project site include the Charles River Basin, listed on the National and State Register of Historic Places, and the Citgo Sign in Kenmore Square which is eligible for listing on the National Register. These historic sites and districts are identified in Figure 12-2.

12.3 POTENTIAL IMPACT

Under the provisions of 950 CMR 71.05, the Massachusetts Historical Commission is required to evaluate the potential effect of a proposed project on State Register Properties in accordance with the following criteria.

a) Destruction or alteration of all or part of a State Register property.
b) The isolation or alteration of a State Register property from its surrounding environment.
c) The introduction of visual, audible, or atmospheric elements that are out of character with or alter the setting of the State Register property.
d) The neglect of a State Register property resulting in deterioration or destruction.
e) The transfer or sale of a State Register property without adequate conditions or restrictions regarding preservation maintenance or use.

Criteria (a), (d), and (e) are clearly not applicable to the Project as there is no direct alternation, destruction, sale or use of a State Register property. Criterion (b) is not applicable as the Bay State Road/Back Bay West Architectural Conservation District itself encompasses the whole area determined necessary to provide a complete context which protects the architectural and historic resources of the area. The new School of Management site is located outside of this area.

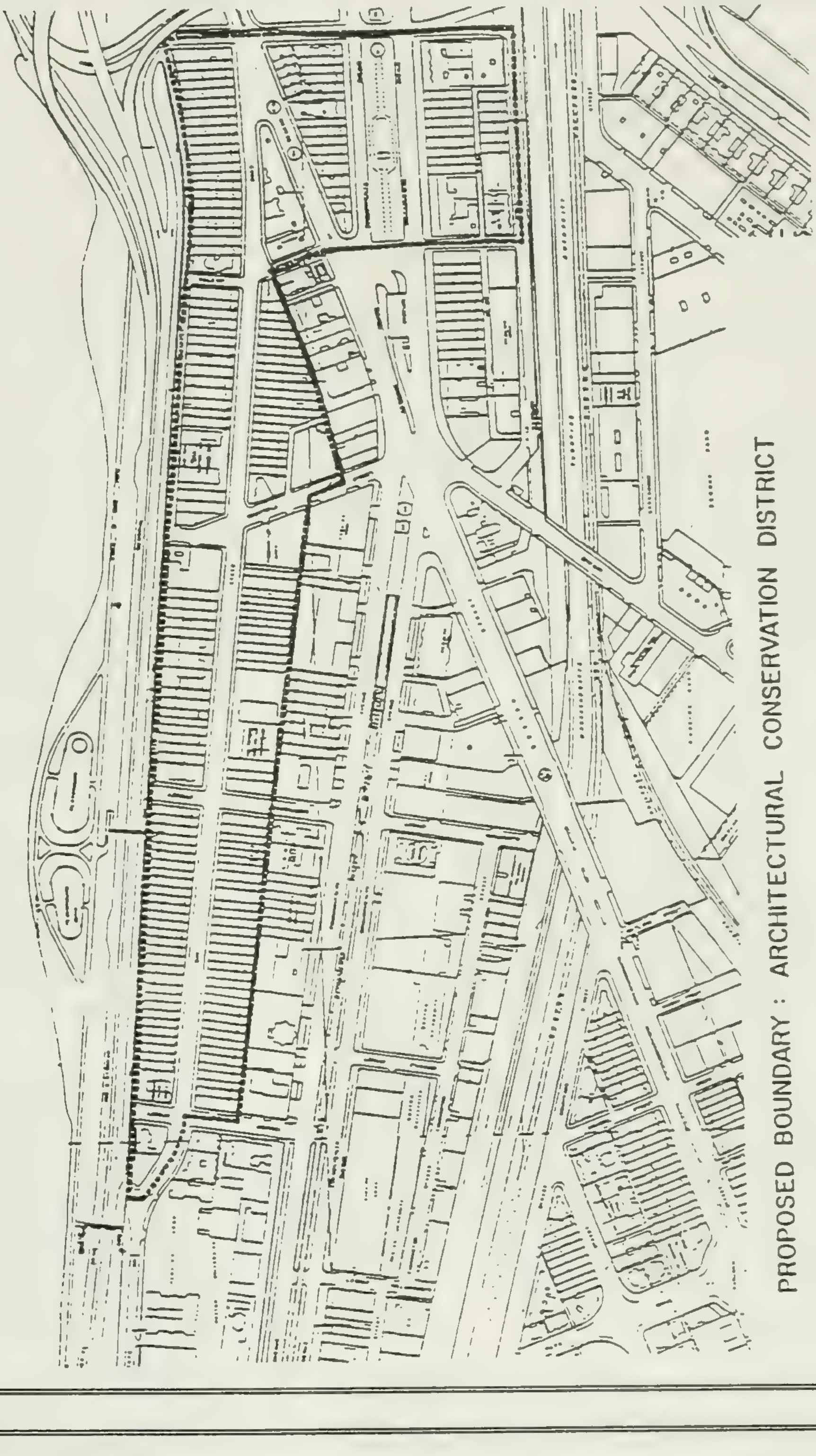
During review of the ten story alternative, the Massachusetts Historical Commission found that the Project would introduce visual elements which were considered to be out of character with the adjacent State Register Historic District (March 13, 1993, letter to Executive Office of Environmental Affairs). The potential for the scale of the Project building to overwhelm the rowhouses on Bay State Road and cast new shadows on the Charles River Basin Historic District was of particular concern. In response to this and other comments, a reduced scale project has been developed. The nine story project reduces the square footage, height, and bulk of the building thereby mitigating potential visual impacts. This reduced project alternative presented in this section has been re-analyzed with particular attention to historic resources of concern. Chapters 3.0, Urban Design; 4.0, Wind; and 5.0, Shadow also provide additional analyses of the nine story project.

Criterion (c) is addressed below in the context of the potential for the new School of Management to introduce elements which could alter the setting of the District. In particular, the issues of visual impact, noise, wind and shadow are addressed. The conclusion of these analyses is that the reduced nine story project adequately mitigates concerns related to visual impacts on the historic area and does not create adverse effects on the District.

12.3.1 VISUAL

The new School of Management building is designed to a address a combination of factors: the dense urban character of Commonwealth Avenue/Kenmore Square; Boston University's program needs; and the architectural elements of both the Charles River Campus and Bay State Road buildings.

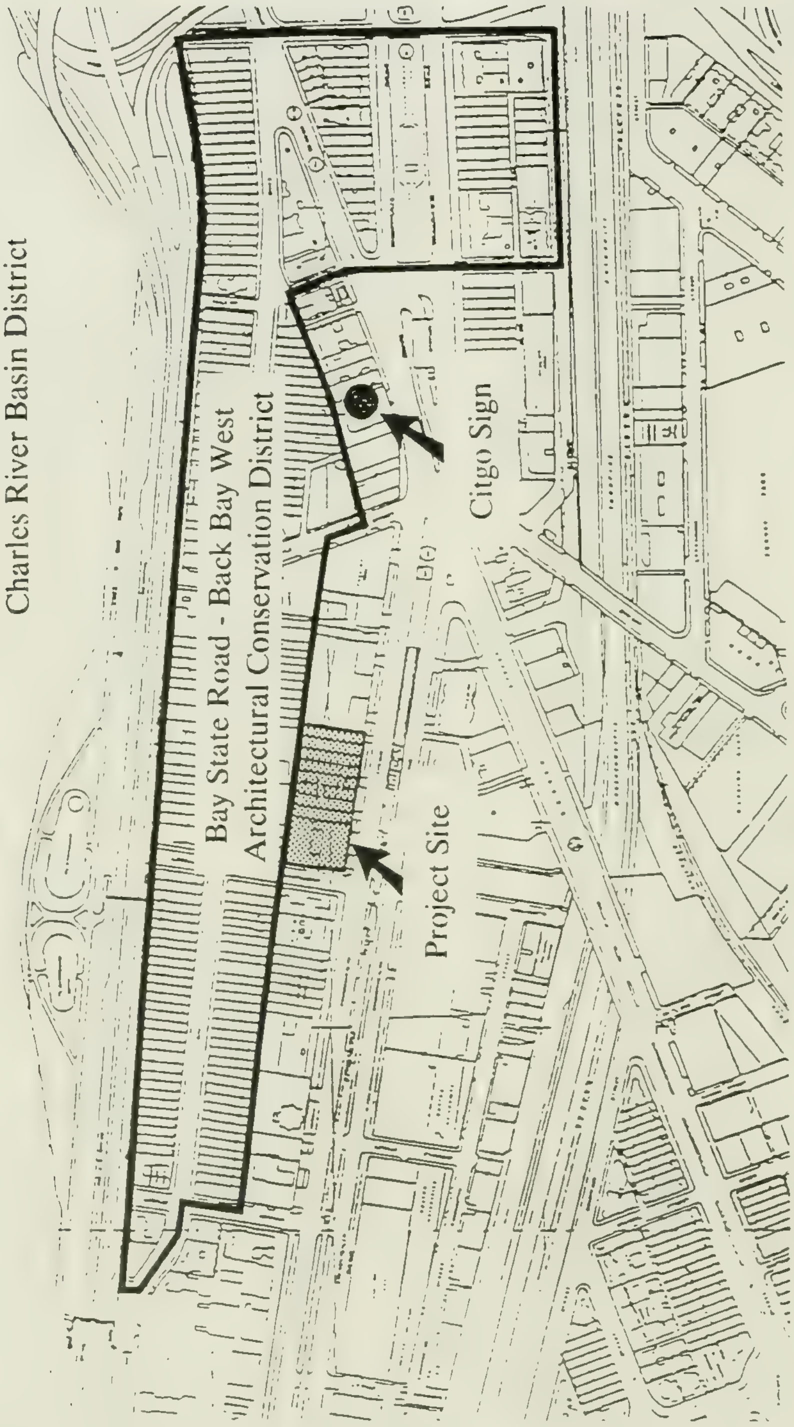
The building design balances consideration of the neighboring historic district, the University's programmatic needs, and the commercial context of Commonwealth Avenue. The nine story project alternative reduces potential visual impacts by significantly reducing the height and bulk of the building. The new School of Management effectively balances the University's need to upgrade the School of Management with the goal of preserving and complementing the historic character of the adjoining District. This balance is achieved through the use of brick and limestone building materials, in a sympathetic manner to historic buildings in the District, such as the Myles Standish Hotel. Furthermore, the orientation of the pedestrian and automobile entrances is away from the District along the existing commercial streets, and the height and massing of the building maximizes the use of the site, without dominating views from within the District. Before and after views of the reduced nine story project including a view from the River bank are found in Figures 12-3 through 12-8. A more detailed description of the design of the new building and additional before and after views are found in Chapter 3.0, Urban Design.



Bay State Road/Back Bay West District

Prepared By:
Fort Point Associates

Figure 12-1


Charles River Basin District
Bay State Road - Back Bay West Architectural Conservation District
Citgo Sign
Project Site

Historic Resources

Prepared By:
Fort Point Associates

Figure 12-2

Before and after construction views of the nine story project were selected in an attempt to better understand potential visual impacts of the new School of Management in relationship to the historic resources in the area. These views were developed by taking photographs of existing conditions from locations which best present the relationship of the Project to historical resources. Computer images of the Project along with existing adjacent buildings were then generated. Perspective views which match the photos were then printed out from the computer and enlarged until they matched the outlines of existing buildings in the photographs. Once this match was achieved, these images were then presented in sketch form.

The Project will be visible from some points within the District, primarily from the north side of Bay State Road within the first half block east and west of Blandford Street. The nine story project with its lowered height, further reduces the introduction of visual elements into the historic district. While the building can be seen from the Charles River and the historic district, it is not obtrusive to the view corridor. Existing views are already blocked by existing buildings at the street level except along certain streets and open areas. This condition will not be significantly altered. Some views of the Citgo sign from the north side of Commonwealth Avenue looking west may be slightly affected (see Figure 3-3).

12.3.2 AUDIBLE EFFECTS

Construction of the new School of Management will temporarily alter the noise environment of the adjacent District due to the operation of construction equipment. This will be a short-lived impact which will take place only during daylight work hours. This effect will be most pronounced during the site excavation, foundation construction, and steel erection phases of the work. Once the building shell is completed, noise generated by interior finish work generally will not be audible outside the building.

Noise associated with the long-term operation of the new School of Management will not alter the character or setting of the adjoining District. Since the entrance to the parking is located on Commonwealth Avenue and the parking for the building will be in an enclosed below grade garage, it is probable that noise impacts associated with vehicle use will be less than that associated with the existing surface parking lot use. Further, the new School of Management building will shield a portion of the District from the noise of trolleys and heavy traffic on Commonwealth Avenue.

Roof mounted mechanical air-handling equipment will be properly attenuated to ensure that noise from this source will not adversely affect adjacent uses, such as the University's dormitories across the alley on Bay State Road.

Noise associated directly with the long-term operation of the building as well as noise resulting indirectly from its operation, i.e. traffic, will not adversely affect the District or other historic resources in the Project area. A more detailed discussion of noise effects of this Project may be found in Chapter 11.0, Construction Impacts, and Chapter 7.0, Noise.

12.3.3 ATMOSPHERIC ELEMENTS

As described in Chapter 8.0, Air Quality, the Project will not introduce any "atmospheric elements" which are out of character with, or which would alter the setting of the adjacent District. Air emissions resulting from construction (short-term impact) and operation (long-term impact) will be negligible and will not adversely effect air quality.

Analyses of potential wind impacts were conducted in accordance with the BRA wind criteria guidelines. The wind environment within the adjacent District (see Chapter 4.0, Wind) will not be adversely affected by the new School of Management building. Wind conditions are predicted to have seasonal and annual wind speeds similar to, or lower than, present conditions (No-Build). For the nine story alternative, a quantitative analysis was conducted showing that several locations within the District, particularly at the Sherborn Street and Bay State Road intersection, are improved with the build condition compared to existing conditions.

A shadow study was conducted in accordance with BRA guidelines for 9:00 AM, noon, and 3:00 PM at the vernal equinox, summer solstice, autumnal equinox, and winter solstice. The Bay State Road area adjacent to the Project site already receives substantial shadow from existing buildings. The District is currently subject to shadows for much of the year cast by historic buildings within the area. However, during the winter months, when outdoor activity is at a minimum, some new shadows will be evident on a few buildings on Bay State Road. New shadows will extend beyond the existing shadows just to the southern edge of the Charles River and Storrow Drive Embankment only in the winter months. As the existing District open space and streetscape are currently in shadow during the winter months, there will be little additional impact from the construction of the proposed building in these public areas. No net new shadows are created on Bay State Road facades from the nine story project during the spring, summer, and fall study scenarios. Analyses of shadow impacts for both the nine and ten story alternatives are presented in Chapter 5.0, Shadow.

12.3.4 CONSTRUCTION

As the owner of buildings surrounding the site, including the majority of buildings along Bay State Road, Boston University has a vested interest in ensuring that construction does not adversely impact these abutting properties. Every precaution will be taken to minimize potential construction impacts on adjacent structures, groundwater levels, utilities, noise and air quality. These specific measures are detailed in Chapter 11.0, Construction Impacts, and will be further refined in the required Construction Management Plan to be submitted to the City of Boston. The University, through its geotechnical consultant, will also prepare a plan to be provided to the BRA which addresses any and all changes in the water table during and after construction.

12.4 ARCHAEOLOGICAL RECONNAISSANCE

An archaeological reconnaissance was conducted in accordance with 950 CMR 70 and in consultation with the City Archaeologist and Massachusetts Historical Commission. The full report is on file with the Massachusetts Historical Commission ("Archaeological Reconnaissance Survey of Boston University's new School of Management Building in Boston, MA." Office of Public Archaeology, Report of Investigations No. 123).

The Project site has no recorded prehistoric archaeological resources. However, based on concerns expressed by the Massachusetts Historical Commission and Boston Landmarks Commission, an archaeological survey was conducted to determine the potential for undocumented archaeological resources, particularly the potential for the remains of a prehistoric fishweir.

The results of the archaeological reconnaissance indicate that the Project area is situated on a parcel that consisted of mud flats and salt marshes near the south banks of the Charles River during the historical period. Therefore, it is likely that the site was either subtidal, intertidal or salt marsh during the prehistoric period. As these type of environs could potentially have supported fishing and shell fishing during the prehistoric period, the Project area has the potential for undocumented prehistoric remains, particularly the remains of a fishweir or similar fish-trapping feature within the undisturbed marine deposits under the historical fill.

In order to assess the potential for fishweir remains, the reconnaissance report compares the geological features of this site with those of the Boylston Fishweir Site, approximately one mile to the east. There are significant characteristics of the site which reduce the potential for fishweir remains. Furthermore, there is a lack of evidence that a defined river or waterway for the passage of fish existed, and there is also a significant difference in absolute elevations between marine deposits at the Boylston Fishweir site and the School of Management site (corresponding marine deposits are approximately 15 feet higher at the School of Management site). Nevertheless, because of the dearth of knowledge regarding the precise environmental conditions at the site and the limited knowledge of locations and forms of fishweirs, the site must be considered as a possible location for a prehistoric fishweir or other similar feature.

12.5 ARCHAEOLOGICAL MONITORING DURING CONSTRUCTION

It is proposed that archaeological investigations of the Project site will be conducted in two stages: 1) archaeological monitoring of the excavations for the perimeter support wall; and 2) archaeological monitoring of the excavations across the interior portions of the parcel for the construction of the parking garage.

Archaeological Monitoring of the Perimeter Support Wall Excavations

Pre-excavation of the perimeter of the parcel for the construction of the perimeter support wall will reach depths up to 10 feet below the surface; thus, in areas around the site, these activities may reach the upper portion of undisturbed marine deposits situated below the level of historical landfill. Therefore, the pre-excavation activities along the perimeter of the parcel will be monitored by a professional archaeologist to identify any evidence of prehistoric activity that may be present in these marine deposits, specifically, wooden stakes or the remains of such that may have formed part of a fishweir or a similar fish-trapping device. In order to make regular inspections of the stratigraphic profile exposed during excavation, to inspect the material from the trench for any evidence of cultural remains, and to record and collect any archaeological remains that are identified, the archaeologist will be on-site at all times during activities that may result in disturbance of marine deposits below the level of historical fill.

In the event archaeological remains are uncovered, an attempt will be made to identify as precisely as possible the location of the remains (i.e., depth below surface and surrounding soil matrix) prior to their removal. The stratigraphic profile will be documented through black-and-white print and color slide photography, and if warranted, a scaled drawing will be developed. Analytical samples, such as charcoal for radiocarbon dating or samples of the associated soil matrix, may also be collected. Any cultural materials that are recovered will be collected and placed in a suitable container or protective packaging for removal to an archaeological laboratory for processing and analysis.

In the event that cultural remains are identified, upon the completion of the archaeological monitoring of the perimeter support wall excavations a completion memorandum will be prepared for submission to the Massachusetts Historical Commission and Boston Landmarks Commission for review. The memorandum will provide the basis for revising the remainder of the scope of work for the archaeological investigations, if warranted, prior to the initiation of the excavation for the parking garage. If no cultural remains are identified during the archaeological monitoring phase, then the next phase - archaeological monitoring of the excavation for the underground parking garage - will be initiated to determine whether any undisturbed archaeological deposits are located elsewhere in the parcel.

Archaeological Monitoring of the Excavation for the Underground Parking Garage

The second phase of archaeological investigations will involve monitoring activities similar to those described above for the excavations for the perimeter wall. The excavation of the interior portions of the site for the parking garage will be conducted in three to four stages, each of which will consist of the excavation of a deposit of soil approximately 10 feet thick across the site. The excavation of the parcel in stages is required for the construction of two or three levels of tiebacks to support the construction perimeter wall. This sequence of excavation will also facilitate the controlled monitoring of excavation activities across the site by a professional archaeologist to identify any evidence of prehistoric activity that may be present in these marine deposits, such as fishweir remains described above.

The general sequence of excavation and archaeological monitoring is proposed as follows. A 10-foot thick deposit of soil will be excavated across the site, generally from the east end (adjacent to the Howard Johnson's Motor Lodge) to the west end (adjacent to Sherborn Street), leaving an earthen ramp in one portion of the site for truck and other machinery access. The archaeologist will monitor this excavation work to determine whether any archaeological remains are present. Once this initial deposit is excavated, the machinery will be moved back to the eastern end of the parcel to initiate the excavation of the next 10-foot thick level. Each subsequent 10-foot thick level of soil will be excavated in a similar manner.

A professional archaeologist will be on site at all times that the excavation of previously undisturbed marine deposits is taking place in order to make regular inspections of the stratigraphic profile that results from the excavation, to inspect the soil deposits for any evidence of cultural remains, and to record and collect any archaeological remains that are identified. Because the excavation contractor will have some flexibility concerning the timing and horizontal sequence of excavation, the monitoring archaeologist may, at his/her discretion and in consultation with the contractor, request the excavation of specific areas of the site within a given 10-foot level to further explore possible archaeological remains that may be identified or to obtain a requisite stratigraphic profile of the deposits.

In order to permit drilling and placement of perimeter wall tieback supports, excavation work may be suspended for approximately two weeks between the excavation of 10-foot levels. Because no further excavation or disturbance of marine deposits is expected to take place during these intervals, no archaeological monitoring will be required. The archaeologist will, however, meet with the contractor daily on-site to maintain adequate knowledge of the proposed excavation schedule. This will ensure that once excavation work is recommenced, an archaeologist will be present to monitor the activities.

Archaeological remains identified during excavation for the underground parking garage will be subjected to the same mapping, recording, sampling, and collection protocols earlier described for the excavation of the perimeter support wall. If cultural remains are identified in one area of the site, the excavation of the remainder of the 10-foot level will continue across the parcel to determine the horizontal extent of the archaeological remains. If the archaeological remains are found to be limited in their horizontal extent, the archaeological site area will be delimited by the archaeologist (using visible means such as surveyor's flagging) as off-limits to further excavation until an appropriate level of archaeological investigation for the remains can be developed. Excavation across the remainder of the parcel would continue, monitored by the archaeologist.

Upon the completion of this phase of the Project, a completion memorandum will be prepared for submission to the Massachusetts Historical Commission and Boston Landmarks Commission for review. The memorandum will provide the basis for determining the appropriate level of archaeological investigations for the cultural remains that are identified. If no cultural remains are identified, the memorandum will recommend that no further archaeological investigations be conducted and that construction activities be allowed to proceed.

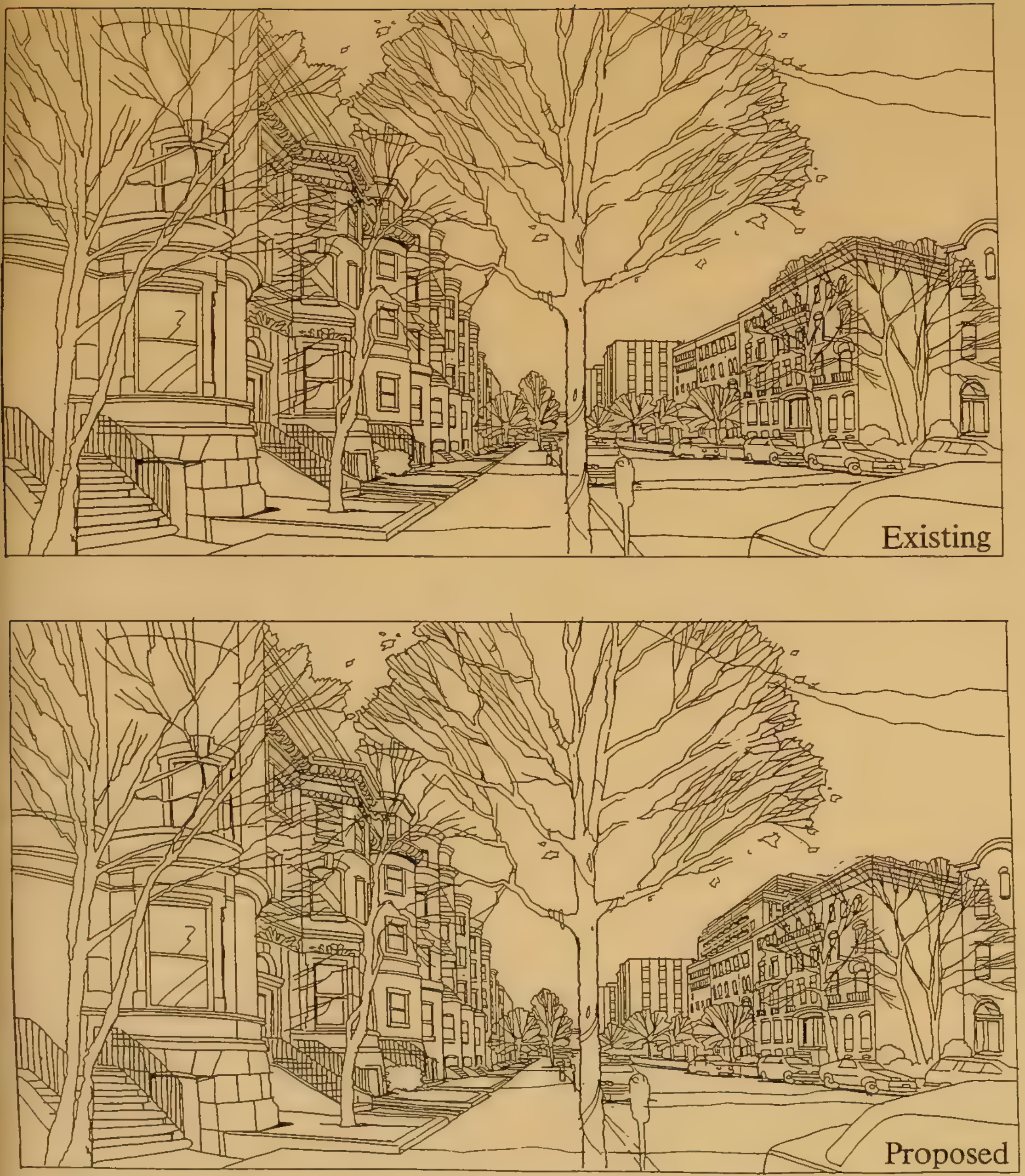
Laboratory Analysis

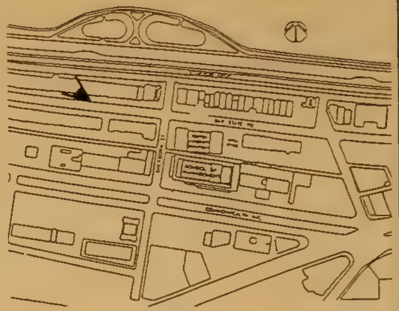
Laboratory analysis will be performed on all cultural materials that are recovered during both the archaeological monitoring and testing phases of the Project. Any artifacts that are recovered will be cleaned, identified, and catalogued. If any analytical samples (i.e., radiocarbon, soils) are obtained, these samples will be sent to appropriate laboratories for processing. An attempt will be made to correlate the recovered archaeological materials with the results of the analytical samples (i.e., radiocarbon dates) and with excavated samples from sites in similar contexts (i.e., the Boylston Street Fishweir site), if the results of those excavations are available. All cultural materials recovered will be curated in the archaeological laboratory at Boston University.

Report Preparation and Recommendations

The results of the archaeological monitoring and test excavations will be summarized in a final report describing the Project, background study, fieldwork, and analysis. The summary report will present a discussion of the results of the archaeological investigations, including a description of the cultural resources recovered. The report will be illustrated with plans of archaeological testing, representative soil profiles, and areas recommended for further archaeological testing, if warranted. A complete inventory of all recovered archaeological materials will be presented in an appendix. The report will include a specific evaluation of the potential archaeological significance of any discovered cultural resources and recommendations to assist project planners with future management decisions concerning cultural resources on the site.

The final detailed archaeological testing and reporting program will be developed in consultation with the Massachusetts Historical Commission and the Boston Landmarks Commission prior to commencement of construction.





BOSTON UNIVERSITY

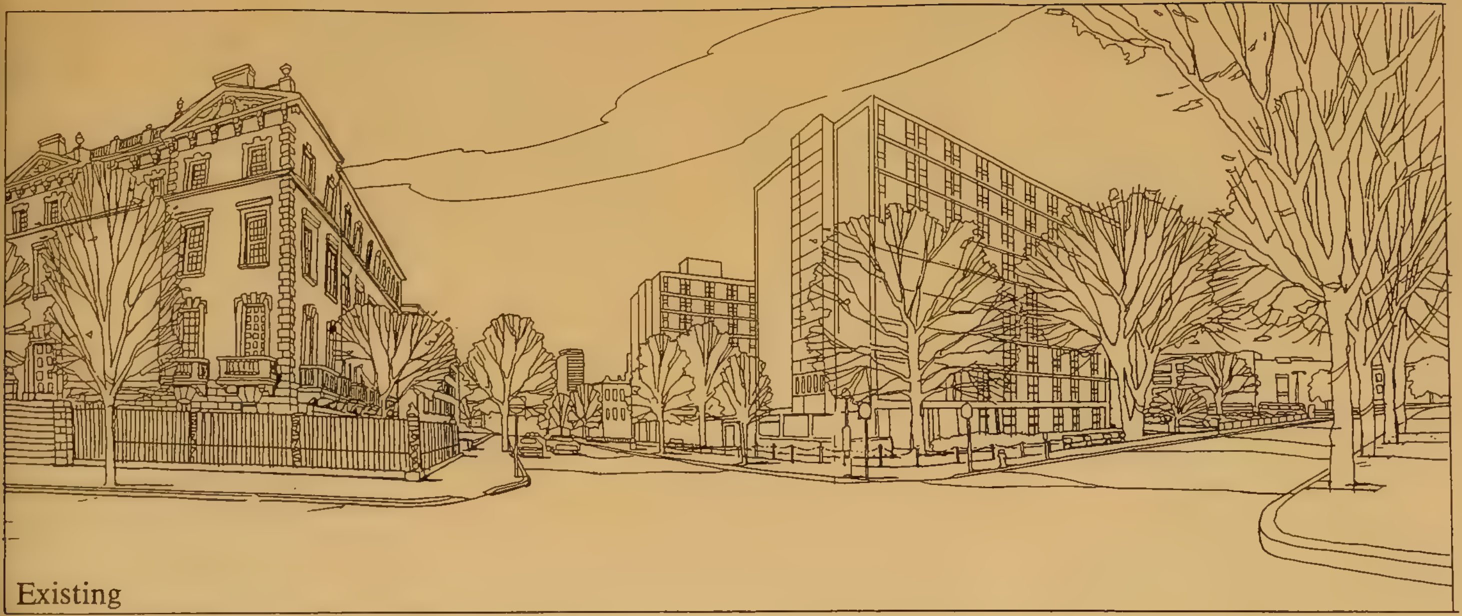
SCHOOL OF MANAGEMENT

Bay State Road
(inside)
Looking East

Figure 12-3

Prepared By
Pressley Associates Inc.

August 1993



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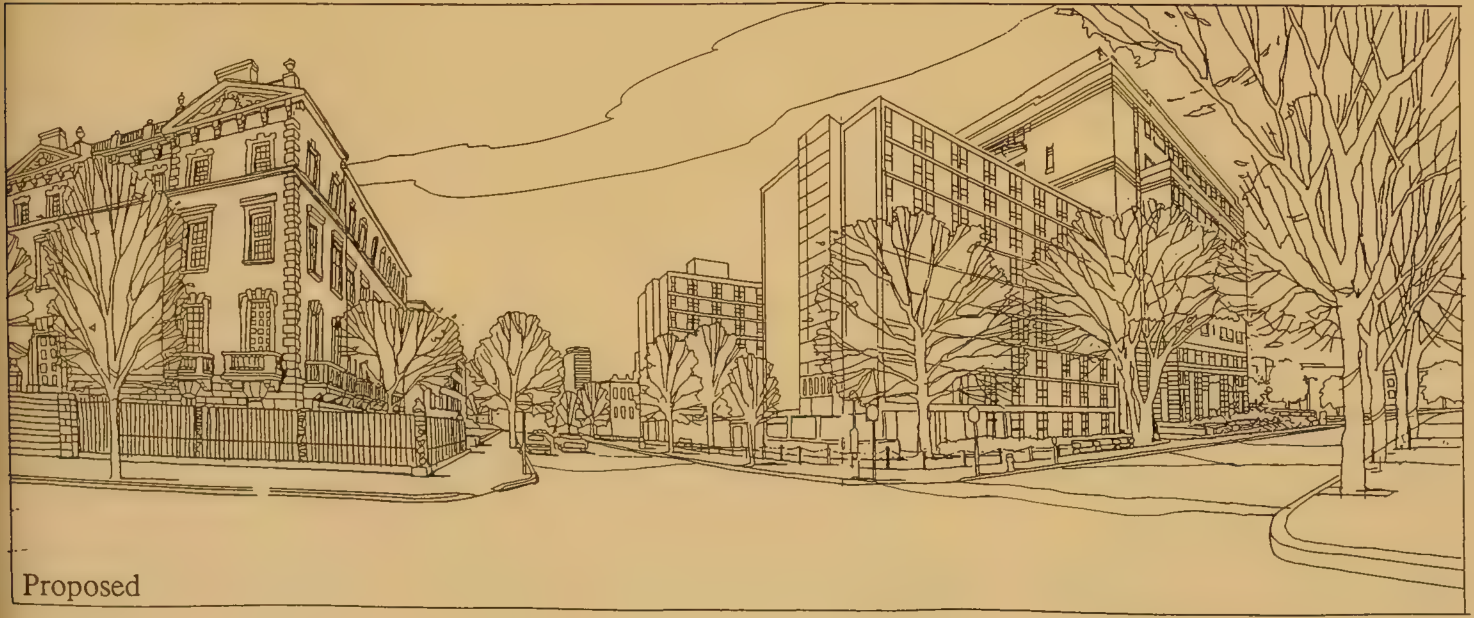

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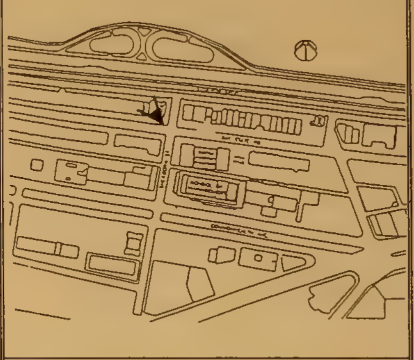

BOSTON UNIVERSITY

SCHOOL OF MANAGEMENT

View from Bay State Road at Sherborn Street Looking East

Figure 12-4

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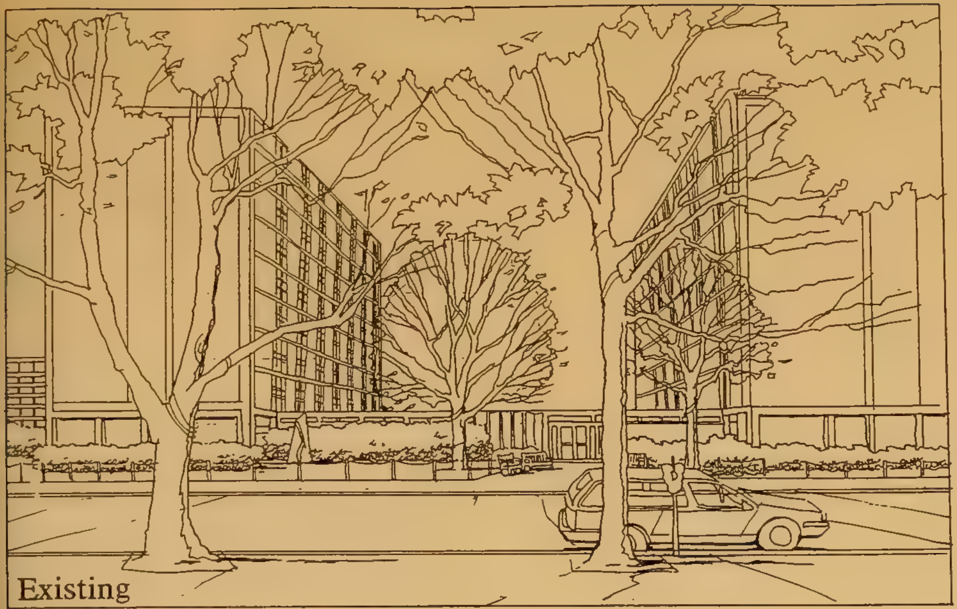
August 1993



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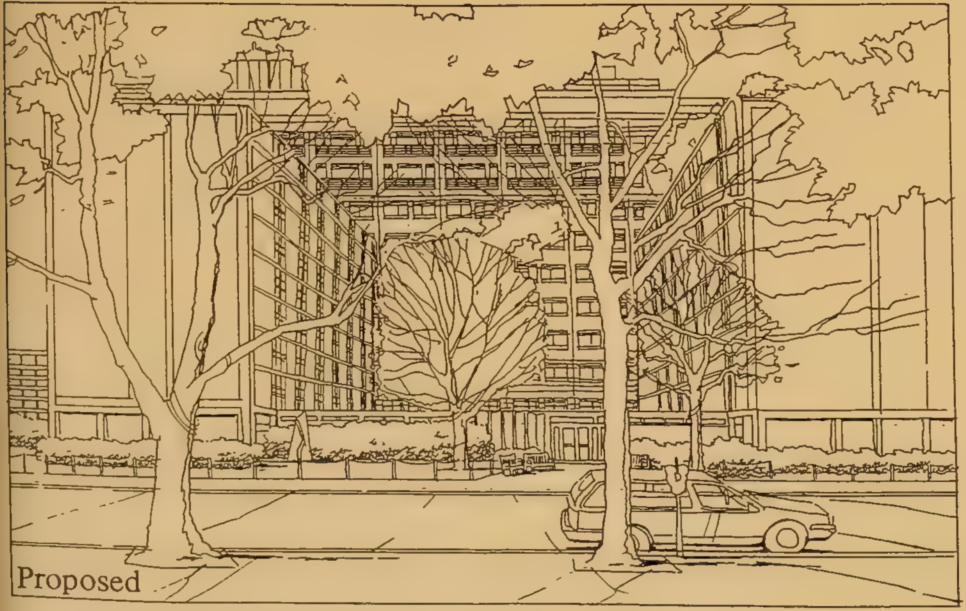

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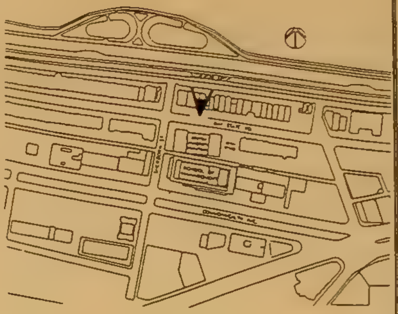

BOSTON UNIVERSITY

SCHOOL OF MANAGEMENT

View from Bay State Road
Looking South

Figure 12-5

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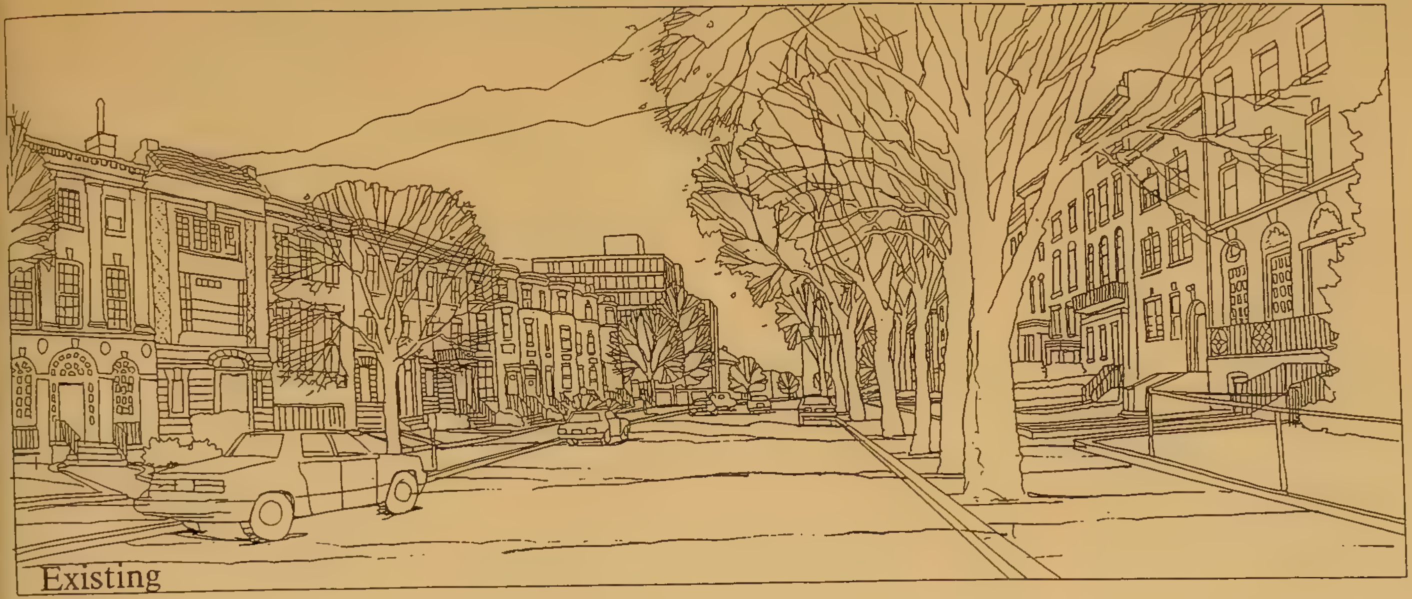
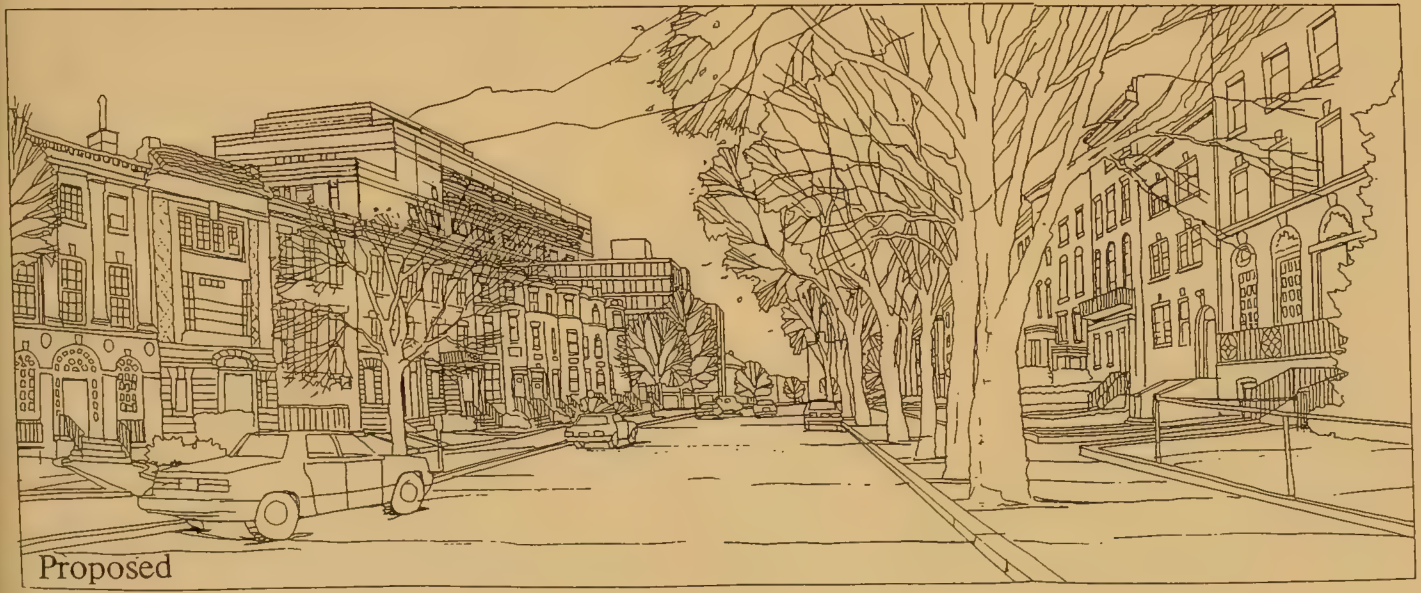
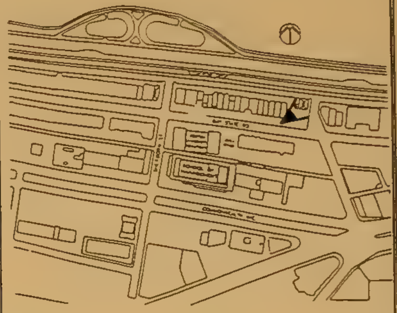
August 1993







BOSTON UNIVERSITY

SCHOOL OF MANAGEMENT

View from Bay State Road Looking West

Figure 12-6

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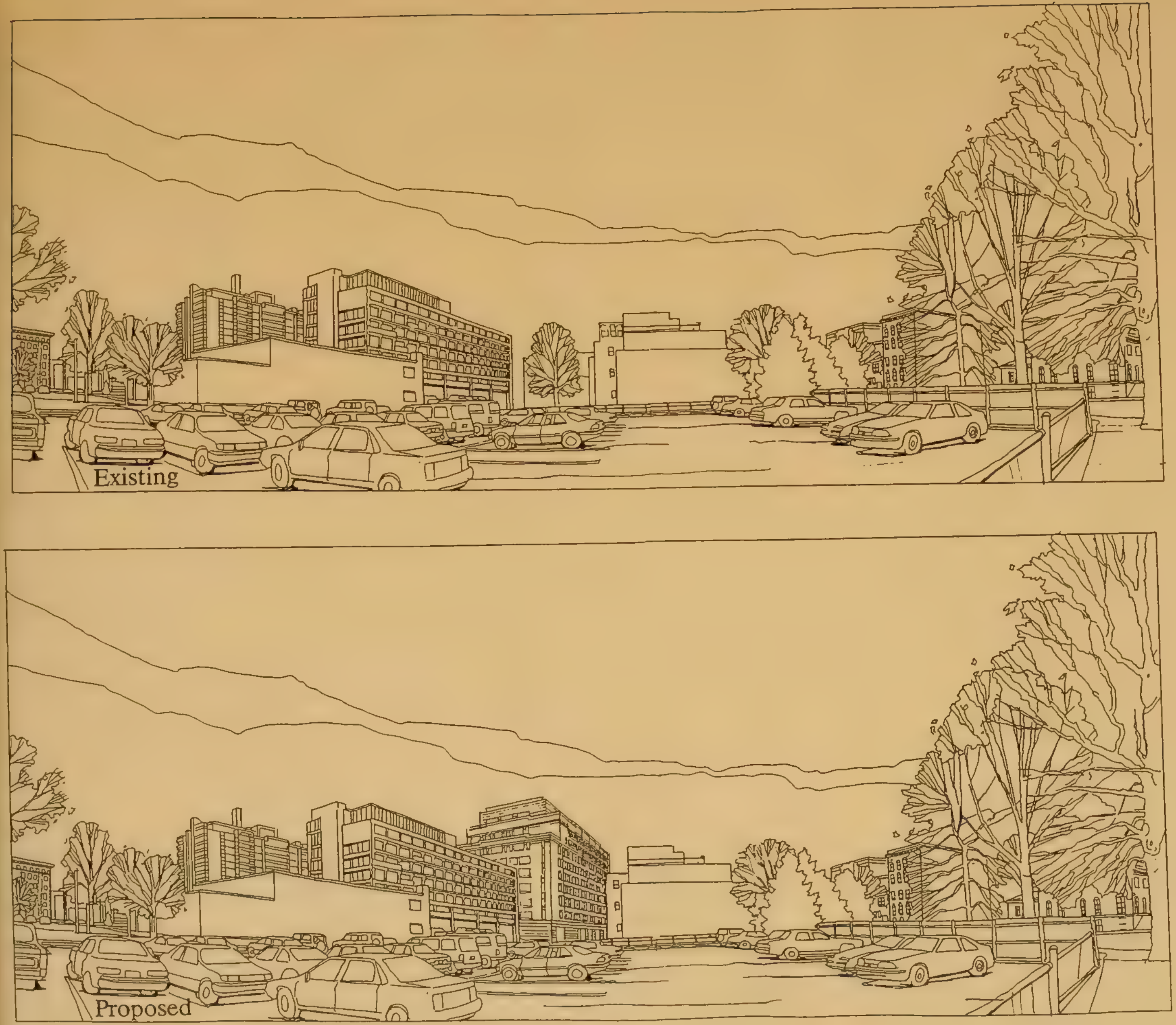

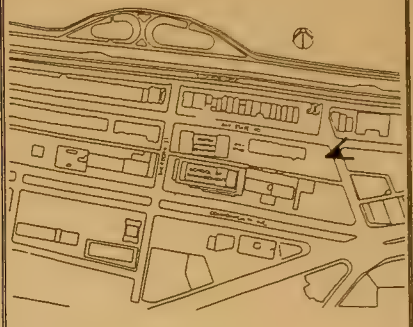

BOSTON UNIVERSITY

SCHOOL OF MANAGEMENT

View from Deerfield Street Looking West

Figure 12-7

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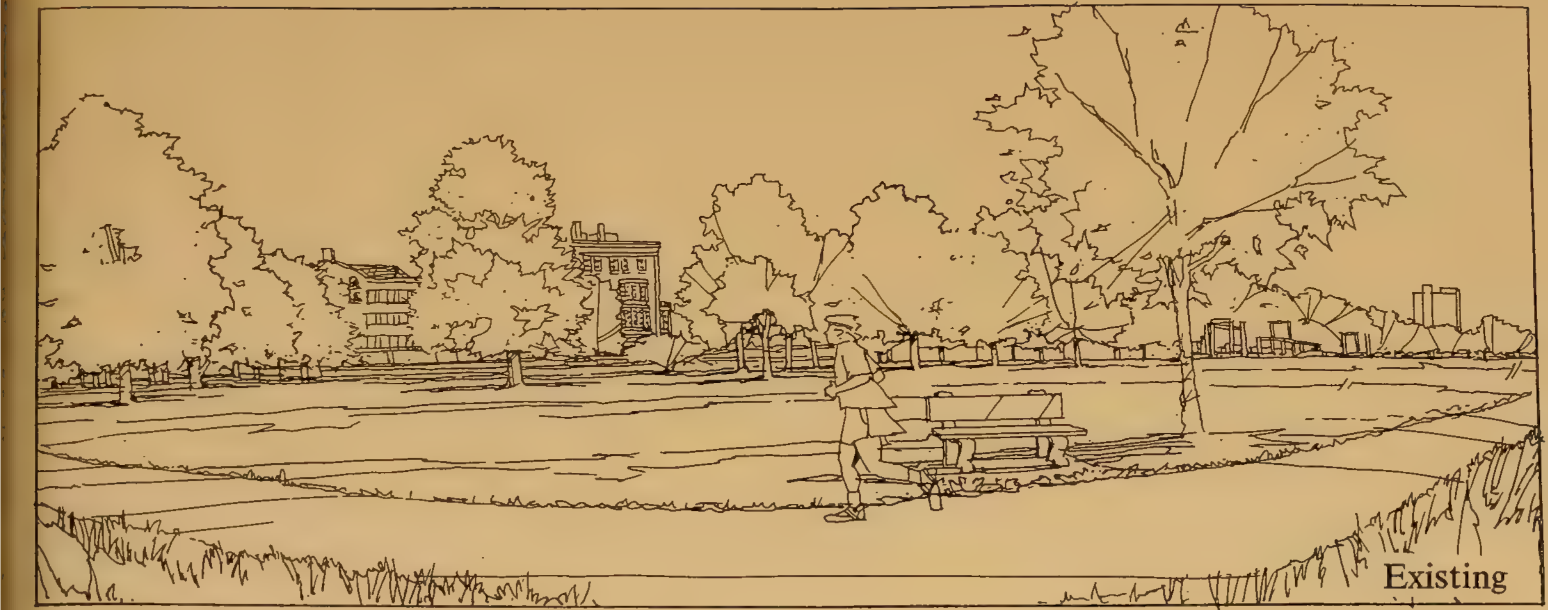
August 1993



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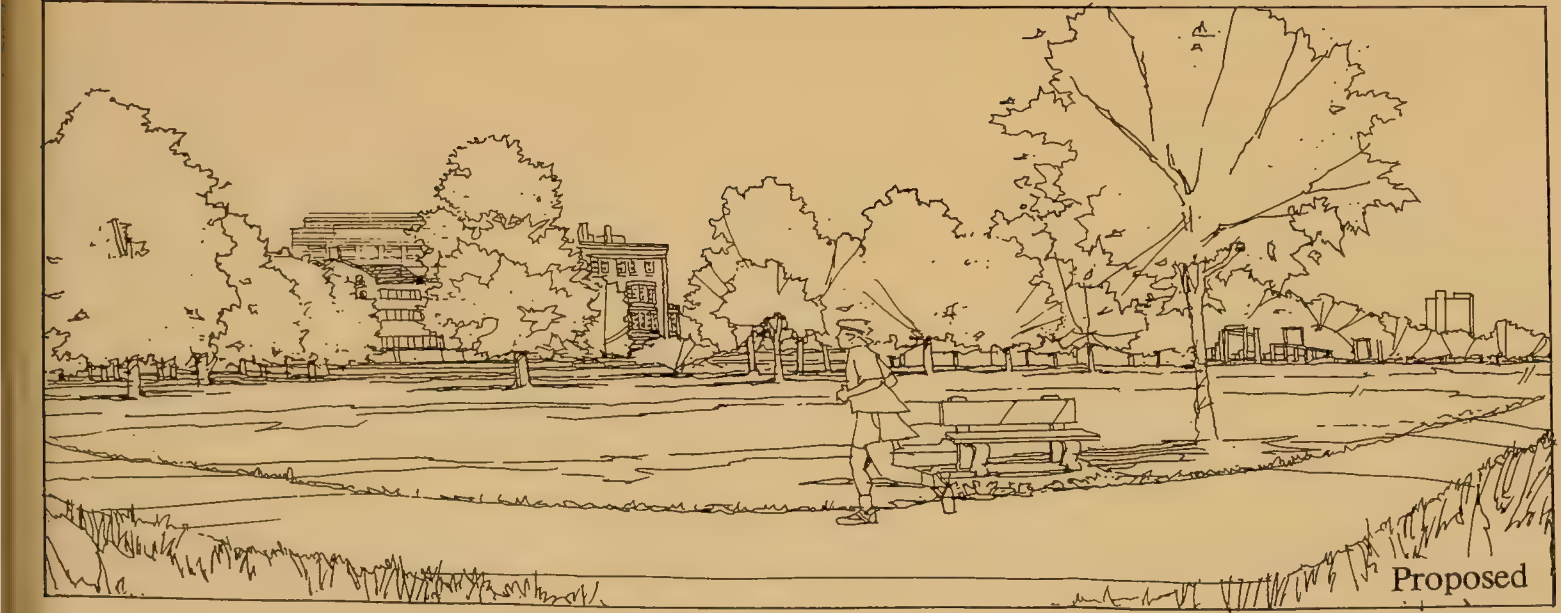

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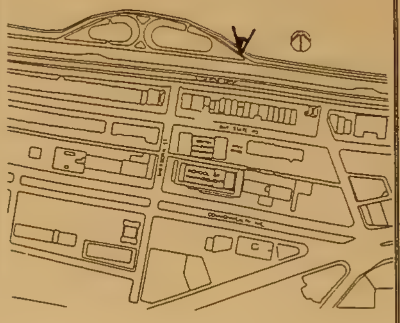


BOSTON UNIVERSITY

SCHOOL OF MANAGEMENT

View from River Bank Looking South

Figure 12-8

Prepared By:
Pressley Associates Inc.

August 1993

13.0 INFRASTRUCTURE

13.0 INFRASTRUCTURE

13.1 INTRODUCTION

This chapter discusses the existing infrastructure systems in the area and the projected utility demands of the new School of Management project. Demands on existing utilities and infrastructure have been recalculated in conjunction with the reduction in building size from ten stories to nine stories. The Project's utility network will be designed to avoid adverse impacts on the existing utilities during construction and to conserve resources after the Project is completed.

All water and sewer connections will be constructed in conformance with Boston Water and Sewer Commission (BWSC) and Massachusetts Water Resources Authority (MWRA) requirements. The proponent will employ the best practical conservation methods in the HVAC systems, plumbing fixtures, and other systems which use water and power. During construction, all open trenches exposing existing water, sanitary, and storm mains will be protected with steel plating for temporary covering. All steel plating will be able to withstand vehicle wheel loads. Chapter 11.0, Construction, provides further discussion on construction mitigation measures. The Construction Management Plan will include detail on utilities protection.

An overview of the Project's utility demand by use is shown in Table 13-1 for both the nine and ten story project alternatives. While the nine story project reduces utility impacts, for the most part, this reduction in demand does not justify a change in utility service size. All calculations and sources for utility demands are found in Appendix C, Infrastructure. In addition, documentation of contacts with affected utility companies can be also be found in Appendix C.

13.2 WATER SYSTEM

Existing Condition

The Boston Proper District receives its domestic and fire protection water supply from BWSC lines which are supplied by MWRA distribution mains. The 16-inch low service water main runs east-west along Commonwealth Avenue from Kenmore Square to Cambridge Street and is the principal main servicing the area of the Project site. This main is predominantly made of pit cast iron (PCI) and was constructed between 1875 and 1896. Its 16-inch diameter is consistent for most of its length with the exception of a 20-inch diameter segment crossing the southerly terminus of the Boston University Bridge. Several branch mains of smaller diameters are serviced by the 16-inch main at various locations along Commonwealth Avenue (see Figure 13-1).

On September 30, 1992, BWSC conducted a hydrant flow test to determine the static pressure, residual pressure, and estimated flows in the existing main that will service the Project site. The hydrant is located at Commonwealth Avenue near Sherborn Street (No. 88-M22H) over the 16-inch PCI line (Circa 1893) in Commonwealth Avenue. The results are as follows:

Static	62.0 PSI
Residual flow	51.0 PSI
Estimated quantity	3,399 GPM
Available at 20 PSI	7,007 GPM

It is evident from the hydrant flow test that the existing 16-inch low service water main has adequate pressure and flow to meet fire protection requirements. In order to prevent any potential adverse impact, pumping devices will be provided to ensure adequate flows at the required pressure for fire suppression. The hydrant flow report is included in Appendix C, Infrastructure.

Project Impact

The total anticipated water demand for the Project is listed in three categories: Domestic Water; Air Conditioning Make-up, and Fire Protection. The maximum demand for each category are as follows:

Domestic Water	168 GPM
AC System	69 GPM
Fire Protection	1,250 GPM

In reducing the building size from ten stories to nine stories, the domestic demand was reduced from 230 GPM to 210 GPM. Accounting for water conservation devices incorporated into the design of the building, the demand is further reduced to 168 GPM. For the AC system, the demand was reduced from 74 GPM to 69 GPM. The demand for fire protection services remains the same for both building alternatives. While the nine story alternative reduces demand on service, the reduction is not sufficient to justify downsizing the service connection to the building.

The Project's domestic water service will tie into the existing system, a 4-inch ductile iron-cement lined pipe (class 52). The 4-inch connection to the 16-inch main in Commonwealth Avenue will include a manual gate valve located between the main and the building (see Figure 13-2).

Based on the hydrant flow test and discussions with BWSC, it is evident that the existing system is adequate to serve both the nine and ten story project alternatives. The Project demand will not have an adverse impact on the existing water distribution system. Additional water conservation measures are described below in section 13.4.

Table 13-1
Utility Chart for Proposed Services

Utility Service	**Agency**	**Service Demand Nine Story**	**Service Demand Ten Story**	**Service Size**
Electrical	Boston Edison Company	3,550 Kilowatts	3,850 Kilowatts	2, 13.8 KV Medium Voltage (2, 5 inch conduits each)
Gas	Boston Gas Company	16,750 CFH	17,500 CFH	6-inch Steel Pipe
Telecommunication	Boston University New England Telephone	N/A	N/A	4, 4-inch Fiber Ducts Encased in Concrete
Water	Boston Water and Sewer Commission	237 GPM	258 GPM	4-inch Connection DI
Fire Protection	Boston Water and Sewer Commission	1,250 GPM	1,250 GPM	8-inch Connection DI
Sewer	Boston Water and Sewer Commission	46,870 GPD	49,575 GPD	12-inch Connection PVC
Storm Drainage	Boston Water and Sewer Commission	3.5 CFS (10 yr. storm)	3.5 CFS (10 yr. storm)	15-inch Connection RCP

Source: **Cannon; Ammann & Whitney**

13.3 FIRE PROTECTION SYSTEMS AND CONNECTIONS

The fire suppression distribution system will consist of an 8-inch ductile iron-cement lined (Class 52) service connection to the 16-inch main in Commonwealth Avenue. In accordance with BWSC standards, the system will be protected by a backflow preventer and double-duty check valve assembly coupled to an electric fire pump. The system will include a jockey pump, fire and jockey pump controllers, fire pump test connections, and the Boston Fire Department (BFD) approved siamese connections located at the facade of the building. The water pump capacity for the fire suppression distribution system will be 1,250 GPM at 175 PSI. The system will be arranged to deliver water through a combination wet standpipe/sprinkler risers in the stairway to the uppermost outlet (within the building) with a water pressure of not less than 65 PSI. The standpipe risers will include a 2.5-inch BFD valve with a 2.5 inch x 2.5 inch reducer coupling, cap and chain at each stairway floor landing.

Each floor level will be protected by a wet pipe sprinkler system with a control valve and flow switch from the standpipe riser located in the stairway. The parking garage will be protected by a drypipe sprinkler system complete with an alarm valve assembly.

13.4 WATER CONSERVATION

It is beneficial for long-term management and operations to utilize water conservation measures throughout the building and for the site irrigation system. Provided below is information on specific water conservation efforts that will be used. The water conservation savings for the nine story project will result in some additional reduction in water demand over the ten story alternative.

Plumbing Fixtures

All plumbing fixtures installed in this Project will be water conserving. Wall hung or floor mounted water closets will operate on a maximum of 1.6 gallons per flush representing a 55% reduction in water use over the 3.5 gallon per flush fixtures. Lavatories and sinks will be provided with 0.5 gallon per minute flow aerators which represent an 80% savings over the 2.5 gallon per minute fixture. The Project will use "no touch" lavatory faucets and urinals will operate at 1.5 GPM. The building will provide two showers for the janitorial staff; the shower heads will be 2.5 GPM low flow heads. Venturi flow meters, which will reduce wasted water during monthly testing, will be provided on all water pumps for fire protection.

Air Conditioning

A central cooling plant will utilize two 650 ton water cooled electric centrifugal chillers. Heat reduction will be accomplished by matching cross flow evaporative cooling towers. These cooling towers have high efficiency drift eliminators to minimize water loss due to drift. Maximum make-up water use for the nine story alternative is 36 GPM at full load operation which is reduced from 39 GPM for the ten story alternative. Average make-up water consumption is less than 1/3 of maximum flow. Cooling towers are designed to minimize water waste and water use required for evaporative heat reduction.

A few small size cooling systems are required to provide heat reduction to dedicated areas (i.e. telecommunications room). These systems are air-cooled, closed-loop and do not use any water. Reuse of condensate is usually associated with steam heat systems which are not employed in the building. Due to the relatively low condensate associated with the building, reuse of condensate is not practical.

Irrigation

The landscaped areas will be irrigated using water conserving design principles. Turf areas will be minimized and plant specifications will be selected based on maximum water conservancy. The street trees and interior planting will employ a drip irrigation system distributing water in gallons per hour. The lawn areas will have a spray system which utilizes water conserving nozzles. Each nozzle will deliver water at 2.0 GPM or less. The irrigation controller will have a timer/clock with water sensing shutoff devices including tensionmeters and rainfall sensors to override the clock when adequate moisture is present in the soil. Short cycles will be set to promote deep root growth and less frequent watering. The site landscaping is the same for both the nine and ten story project alternatives.

13.5 SANITARY SEWER

Existing Condition

The Boston Proper District (2,650 acres) has a sewage collection system which was constructed mostly in the mid-to-late 1800s and expanded through 1930. Smaller sewers in the area, those 6 to 18 inches in diameter, were typically constructed of vitrified clay pipe. Larger sewers were generally constructed of brick and mortar, whereas modern day sewer lines are often reinforced concrete pipe (RCP). Since much of the system serving the area was originally designed as combined sanitary/storm sewer, there are several large diameter pipes in the system. Approximately 25% of the Boston Proper District, including the Project site, is served by the MWRA's Charles River Valley Sewer (CRVS), which flows to Deer Island for treatment via the MWRA Ward Street Headworks. The CRVS was constructed in 1892 of brick and varies in size from 42 inches to 78 inches x 84 inches. Sections of the CRVS have been separated; however, the major portion of the sewer remains combined.

The portion of sewer line located at the building site is beneath the sidewalk in Commonwealth Avenue. This sewer does not combine with any stormwater drains. Site stormwater will discharge into a storm drainage system that outfalls directly into the Charles River. (Stormwater is more fully discussed in section 13.6 below.) Sanitary sewage from the new School of Management will be discharged to the existing 18-inch sanitary main in Commonwealth Avenue which flows east toward Deerfield Street. This sewer, dating back to 1894, is linked by a series of brick and mortar, and pre-cast concrete manholes. The Sanitary Sewer Distribution System is illustrated in Figure 13-3.

According to the Code of Massachusetts Regulations, 310 CMR 15.02(13), "Estimated sewage flows ... should be considered in relation to actual meter readings of established flows from known or similar installations. Generally, estimated sewage flows will be based on 200 percent of average water meter readings in order to assimilate maximum daily flows." The 200 % factor accounts for infiltration. In accordance with the CMR regulations, average water meter readings were obtained from BWSC on February 2, 1993, for all addresses which may impact the 18-inch sanitary sewer in Commonwealth Avenue between Sherborn Street and Deerfield Street.

A hydraulic analysis was conducted using the data obtained from the BWSC to determine an approximate maximum daily flow in the 18-inch sanitary sewer in Commonwealth Avenue. The results of the analysis showed that this segment of sewer operated at approximately 21% of its capacity, or at 1.01 cubic feet per second (CFS).

Project Impact

The School of Management project will discharge materials into the 18-inch sanitary sewer main in Commonwealth Avenue via a 12-inch polyvinyl chloride (PVC) service connection to the building (see Figure 13-4). This connection will be made using a wye branch connection. The total sanitary discharge generated by the nine story alternative is estimated to be 46,870 GPD (46,547 GPD for school and office occupancy plus 323 GPD wastewater from the air conditioning system). The maximum sanitary flow per day for the nine story alternative is calculated to be 279 gallons per minute (GPM) or 0.6 CFS. The total sanitary discharge for the ten story alternative was estimated to be 49,575 GPD (49,225 GPD for school and office occupancy plus 350 GPD from the air conditioning system). The ten story project maximum daily sanitary flow was calculated to be 300 GPM or 0.7 CFS. The nine story project alternative reflects an estimated discharge reduction of 2,705 GPD when compared to the ten story alternative. However, this reduction in flow does not justify downsizing the sewer connection.

According to calculations, the additional flow from the ten story alternative to the existing 18-inch sanitary sewer system will increase the operational level from approximately 21% to approximately 36% of the pipe's capacity. The nine story alternative will increase the operational level to approximately 34% of the pipe's capacity.

Sewer capacity and demand from the Project was discussed with BWSC staff at meetings and in conjunction with review of the 25% plan submission referenced in Appendix C, Infrastructure. BWSC indicated that the existing system is adequate to include the additional flow from the Project. Following notification by the BWSC letter dated November 10, 1992, oil/water separators will be installed in the garage. Oil/water separator designs will meet MWRA and BWSC use regulations. In accordance with the BWSC sewer use regulations, a grease trap serving the canteen and dining room in this building will be installed. Grease trap designs will meet all City of Boston requirements.

13.6 STORM DRAINAGE/WATER QUALITY

Existing Conditions

The Project site currently serves as a surface parking lot. It contains a bituminous concrete surface which is graded so that the majority of storm water runs into two catch basins approximately 70 feet apart located in the eastern section of the parking lot. Storm water is collected by these catch basins and discharged to the existing 18-inch storm drain in Commonwealth Avenue. This 18-inch line serves the area in and around the site beginning approximately 240 feet west of Sherborn Street and ends at Deerfield where it discharges into the Muddy River Conduit (MRC). The MRC is a 9 x 11 foot combined sewer outfall. The drain in Commonwealth Avenue varies in size from 15 inches to 24 inches. The line was originally constructed by the MBTA and ownership was later transferred to BWSC (see Figure 13-5).

Hydrologic and hydraulic analyses were conducted on the storm drain from its beginning to a manhole located 1,174 feet downstream, and it was determined that the system was not surcharged. The furthest downstream section was calculated to operate at approximately 78% of its capacity for a ten year storm event.

Project Impact

The drainage calculations for the site will remain the same for both the nine and ten story project alternatives. Neither the building footprint nor the site layout change under both project alternatives. Drainage patterns and areas are the same under both alternatives as well. The proposed storm drain service from the building is a 15-inch pipe which will tie into the existing 18-inch storm drain (see Figure 13-6).

The maximum storm water flow based on a rainfall intensity of four inches/hour is estimated to be 3.5 CFS in the ten year storm event (see Appendix, C, Infrastructure for calculations). Due to the fact that the amount of runoff will be reduced by decreasing the area of impervious surface, the existing storm drain will have more usable capacity. Based on an hydraulic analysis of the proposed action, the operational flow of the existing 18-inch section of storm drain will be reduced by approximately 5%.

In addition, total site runoff will be reduced in post-development conditions. Virtually the entire site is currently a paved parking lot whereas up to 15% of the building site will be landscaped following Project completion. By decreasing the amount of impervious area and increasing landscaped areas, a lower runoff coefficient will be generated, thereby reducing stormwater inflow.

13.7 ELECTRICAL SERVICE

Electrical service for the Project will be provided by the Boston Edison Company. The ten story alternative was anticipated to have an electrical load of approximately 3,850 KW. The nine story alternative is anticipated to have an electrical load of approximately 3,550 KW reflecting a reduction in demand of 300 KW. With an anticipated 90% power factor, this correlates to a transformer load of 3,944 KVA for the nine story alternative and 4,278 KVA for the ten story alternative. The transformer vault and primary switch gear are located in the first subsurface parking level. The reduction in service demand for the nine story alternative does not warrant a change in electrical utility design.

The new service entrance switchgear will be a freestanding modular, metal-enclosed assembly, indoor type. It will have over current, under voltage, and ground fault protection relays.

Boston Edison will provide two medium voltage, 13.8 KV utility services. One of these services will be the proffered service, the second will be an alternate. These services will be connected to a new medium volt service entrance switchgear lineup located below grade in the first parking level.

The proposed distribution system will allow for two main double-ended 480V/277 volt secondary unit substations to handle the entire building. They will be separated by load such that one substation will handle primarily mechanical and elevator loads and the other substation will handle normal building loads.

The estimated size of the substations is as follows:

Penthouse: 2 substations @ 1500 OA/2000 FA KVA: 480 Volts.
Parking Level: 2 substations @ 2000 OA/3000 FA KVA: 480 Volts.

The secondary (600V) distribution system will be designed to respond to the power needs for this building as well as allow flexibility to accommodate future space/function changes. The distribution voltage at each unit substation will be 480 Volts, 3 Phase, 4 wire plus ground. This will provide service to equipment and lighting loads. This voltage will be further transformed down to 208V/120 Volts, 3 Phase, 4 wire for receptacles, miscellaneous equipment, etc.

Emergency power will be provided by a 1,000 KW diesel engine-driven, water-cooled engine set, located within the penthouse area. A dual transfer pump set and two 6,000 gallon tanks, located in the parking level will provide fuel for emergency and boiler systems. This system will provide in excess of seven hours of capacity. A ten gallon/day tank will provide for additional fuel capacity at the generator set. The generator loading is estimated to be 661 KW and will serve emergency lighting, fire pump, one elevator in each elevator bank, sump pumps, parking level ventilation, atrium smoke exhaust systems, and fire protection alarm systems. A remote generator plant annunciator will be provided at the fire command center for system monitoring (see Figure 13-7).

13.8 ENERGY CONSERVATION

The energy conservation features for both the nine and ten story project alternatives remain the same. They include:

- Variable frequency drive supply and return air fans for each variable air volume system.
- Air economizers with enthalpy control for each central air handling units.
- Energy efficient chillers of 0.63 KW/Ton full load performance versus baseline of 0.73 KW/Ton.
- Two-speed cooling tower.
- Multi-stage constant volume pumps.
- High efficiency motors (1750 RPM).

- Step-fired heating hot water boilers to schedule water temperature based on outdoor temperature.
- Building automation system with energy management controller capable of performing all management functions necessary to reduce energy consumption (i.e. automatic on/off carbon monoxide sensing devices in the parking garage).
- Energy efficient lighting.
- High efficiency transformers.
- Power factor correction capacitors.
- Occupancy sensors and timers for lighting control.

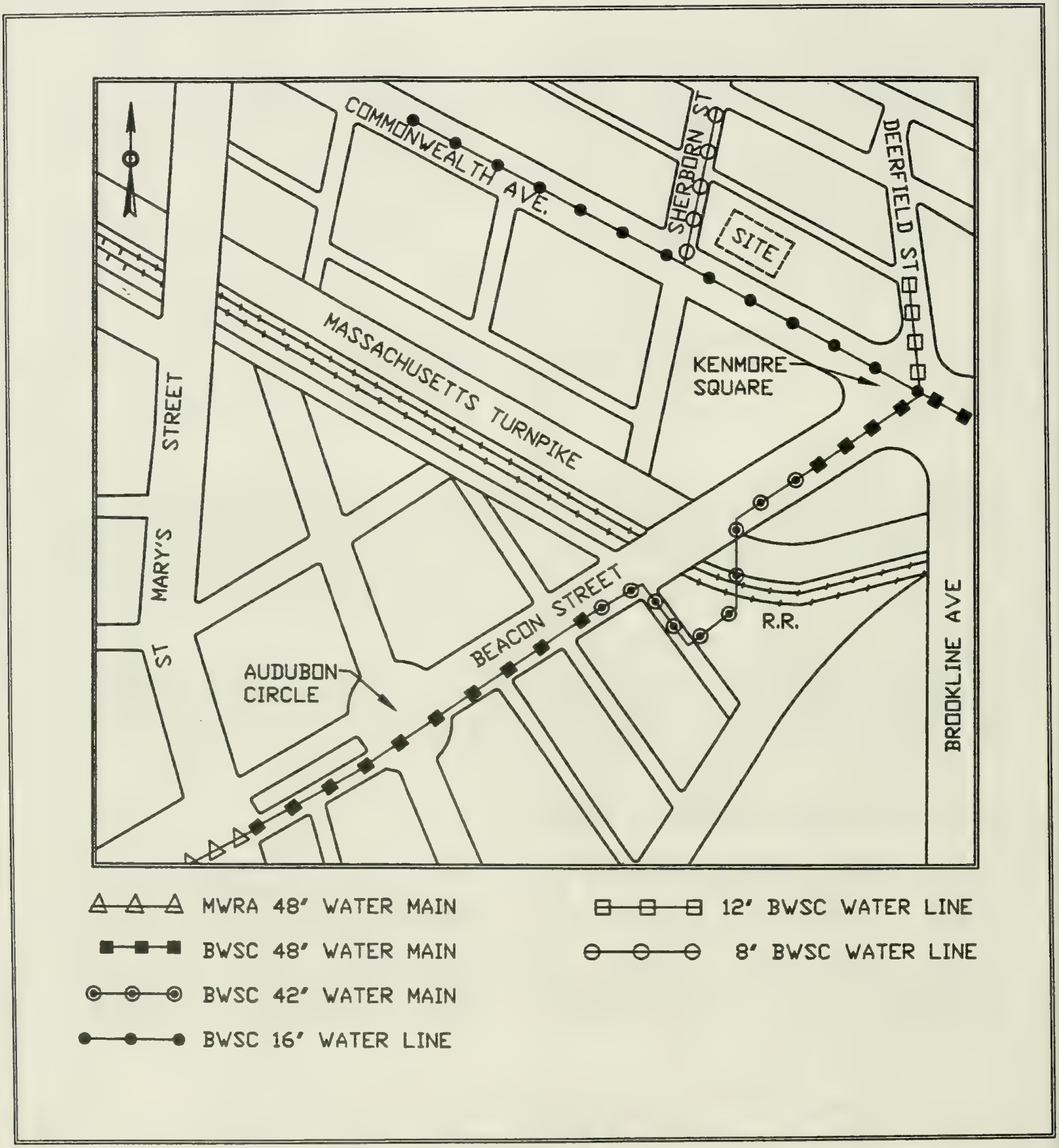
The building is designed to be cooling intensive and will only demand intermittent uses of domestic hot water and, therefore, solar heating is not a practical alternative for the Project.

13.9 GAS

Gas for the Project will be supplied by an existing 24-inch line owned by Boston Gas located on Commonwealth Avenue. The connection to the building will be through a 6-inch steel pipe connecting to the existing gas main. The anticipated maximum load for the nine story alternative is 16,750 CFH. This figure represents a reduction of 750 CFH when compared to the ten story alternative. Gas will serve heating, hot water boilers, and kitchen equipment. The existing main located beneath the curb on Commonwealth Avenue is a 24-inch steel pipe. The existing line is a low pressure line which feeds an 8-inch connection on Sherborn Street and a 6-inch connection on Deerfield Street. Both connections to the 24-inch main are steel pipes with subsequent services to the immediate area. The reduction in demand between the nine and ten story alternatives does not warrant a change in gas utility design (see Figure 13-8).

13.10 TELEPHONE AND DATA SERVICE

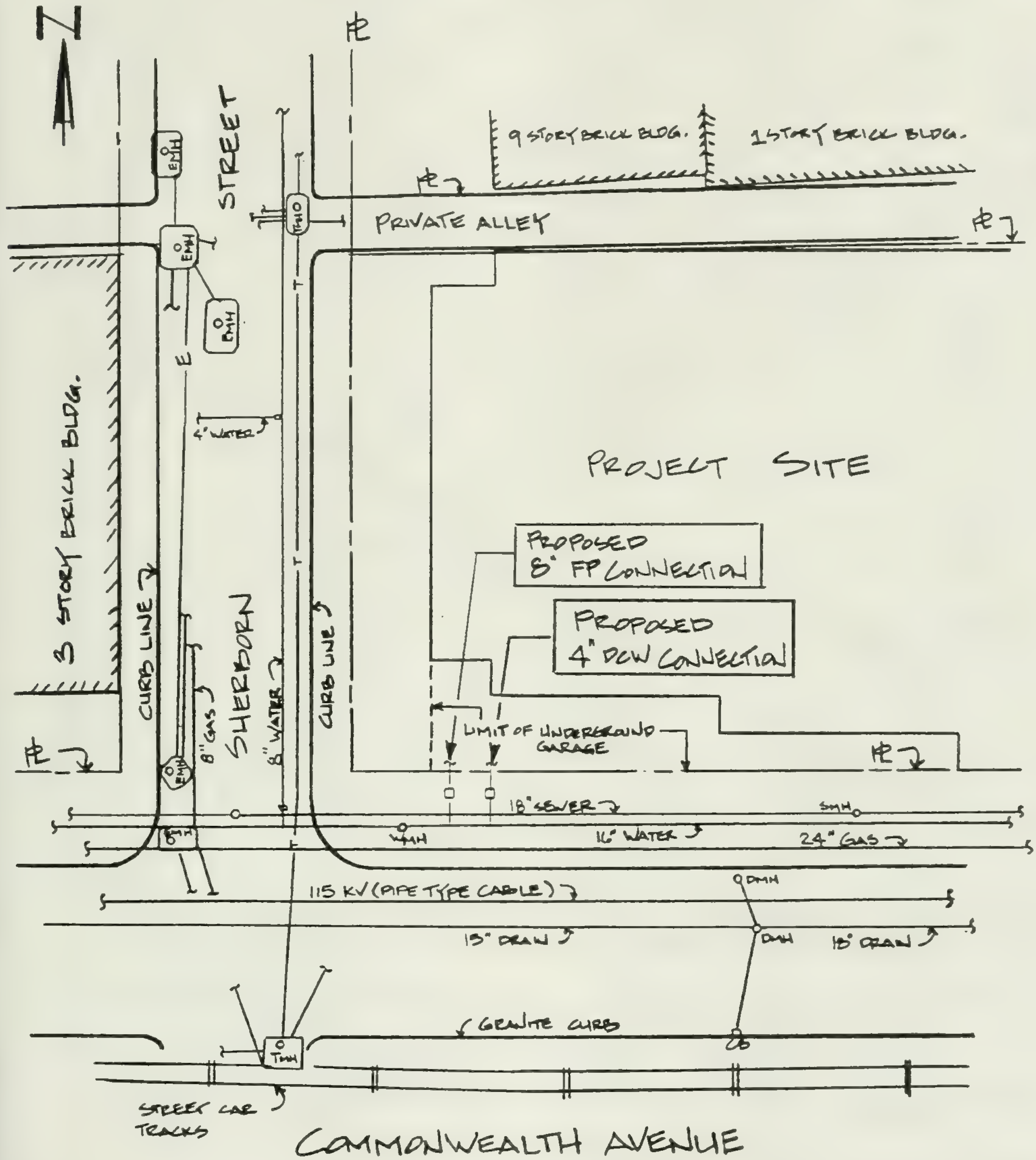
The proposed services and internal network of the telephone system remain the same for both the ten story and nine story project alternatives. The Boston University telephone and data network system will be extended to the Project site by New England Telephone and Telegraph Company to a telecommunications service room located on the north face of the building one level below grade. New England Telephone has placed duct banks in the private alley (adjacent to the site) in order to service the Project (see Figure 13-9).



Existing Water Distribution System

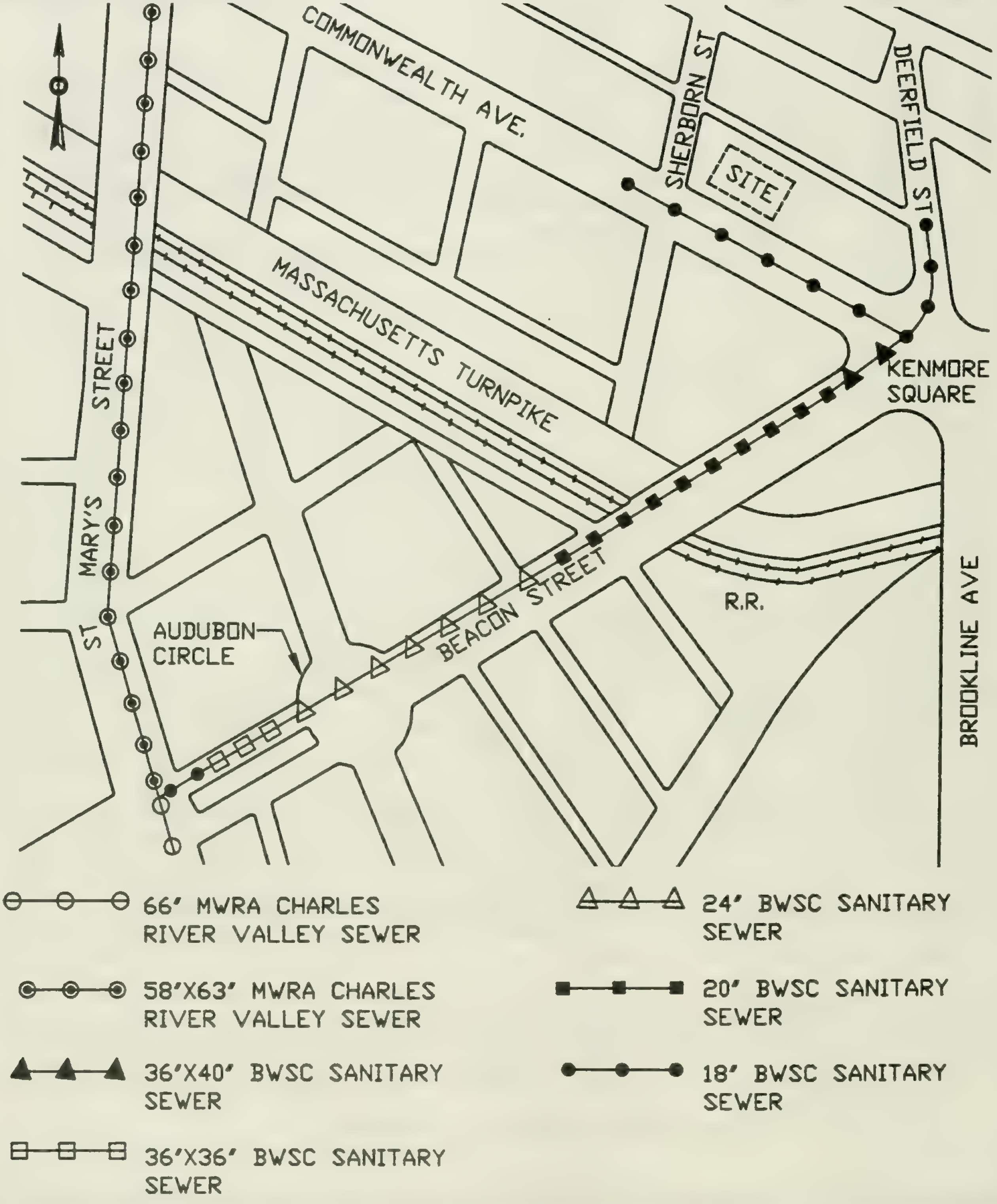
Prepared By:
Amman & Whitney

Figure 13-1



Water Connections

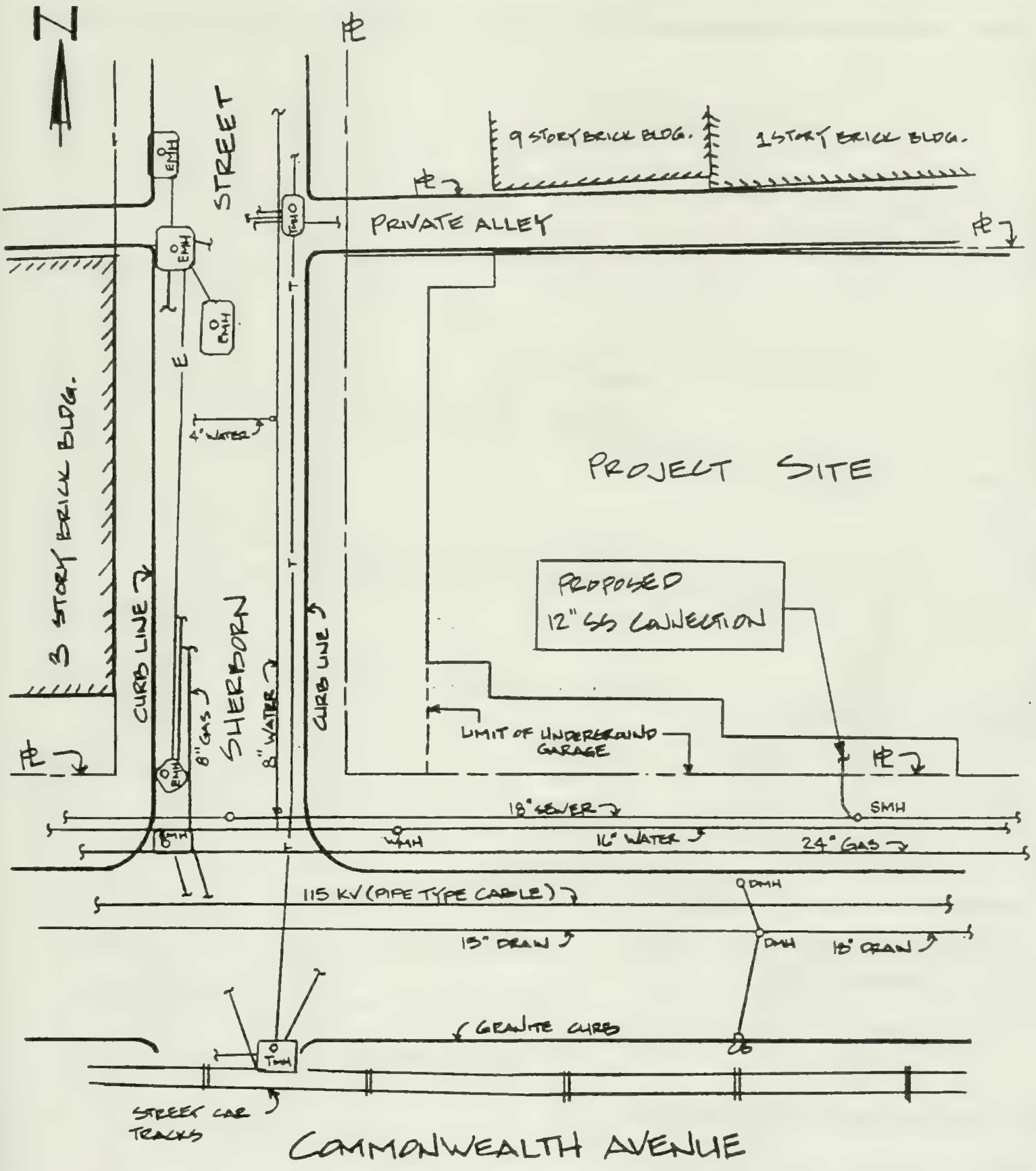
Prepared By: Amman & Whitney	***Figure 13-2***



Existing Sanitary Sewer Distribution System

Prepared By:
Amman & Whitney

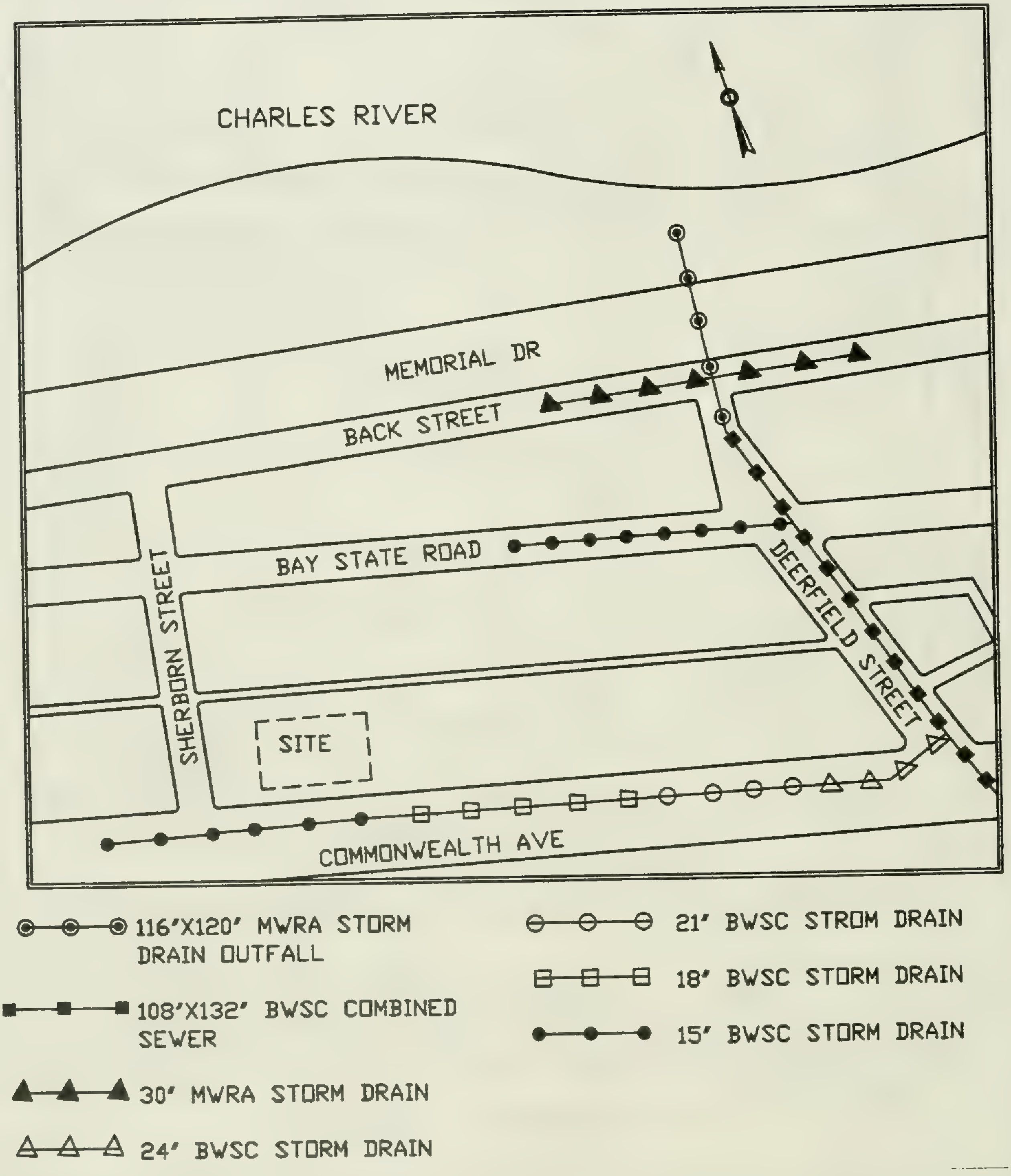
Figure 13-3



Sewer Connection

Prepared By:
Amman & Whitney

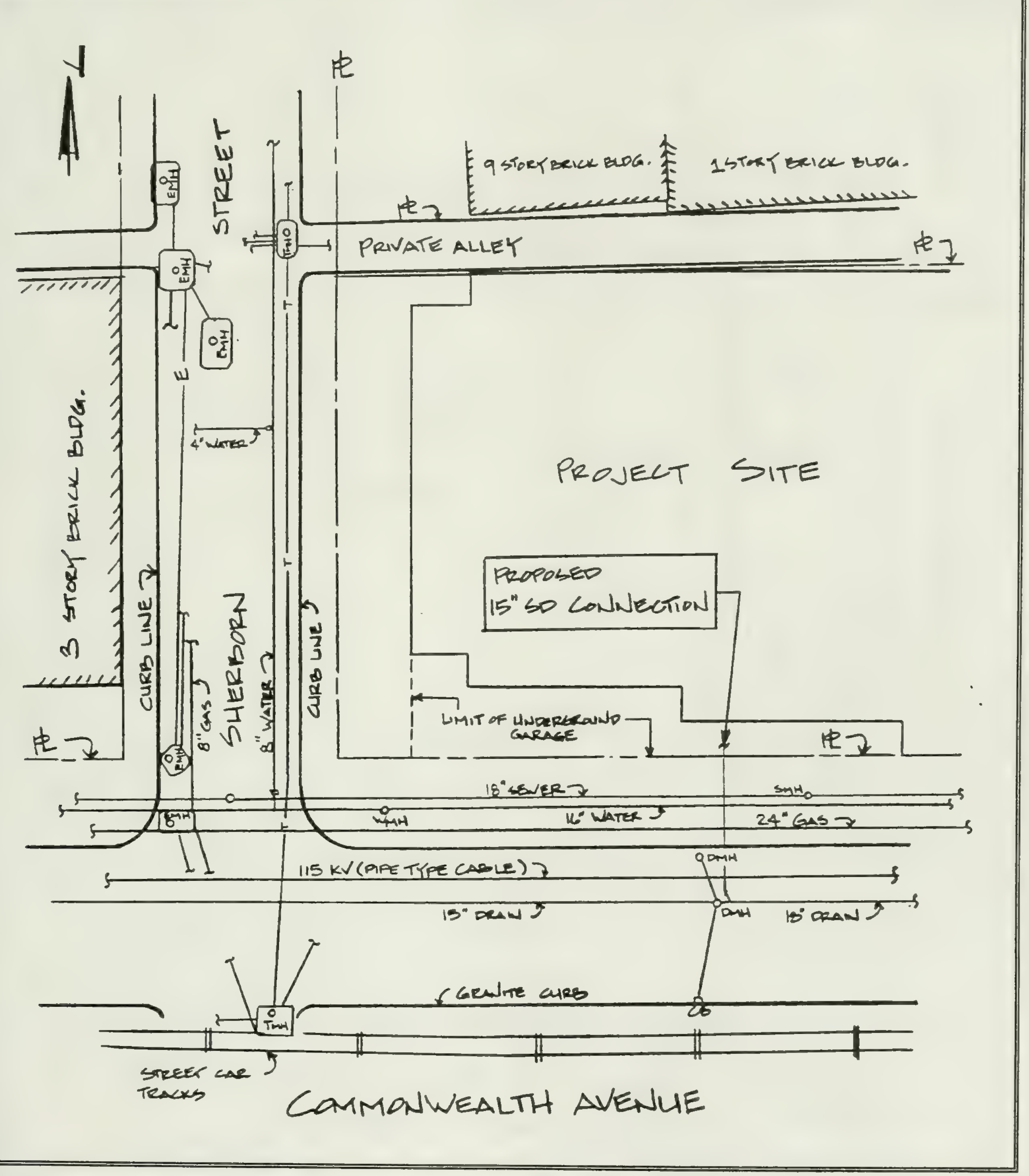
Figure 13-4



Existing Storm Drainage Distribution System

Prepared By:
Amman & Whitney

Figure 13-5

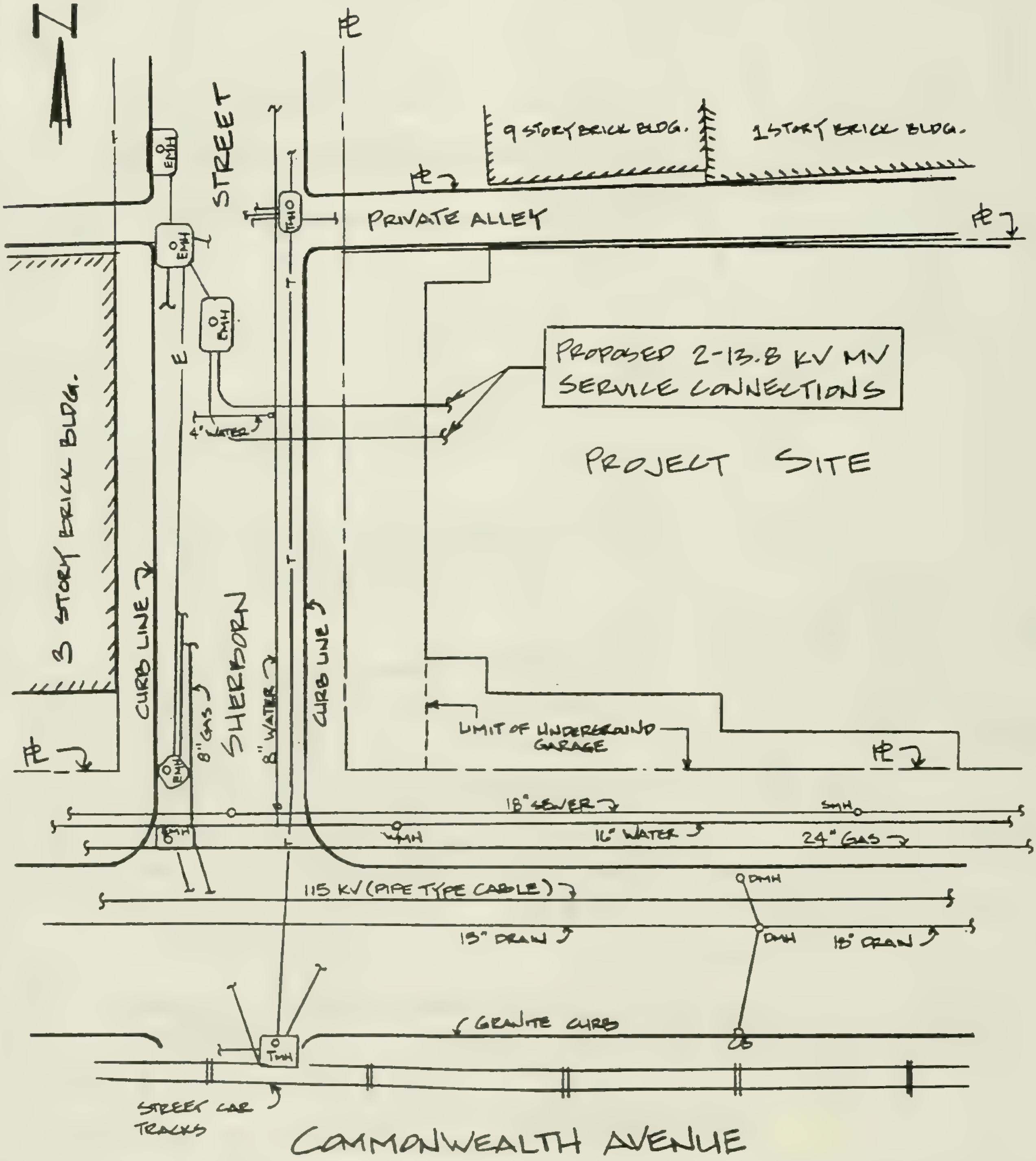


Storm Drain Connection

Prepared By:

Amman & Whitney

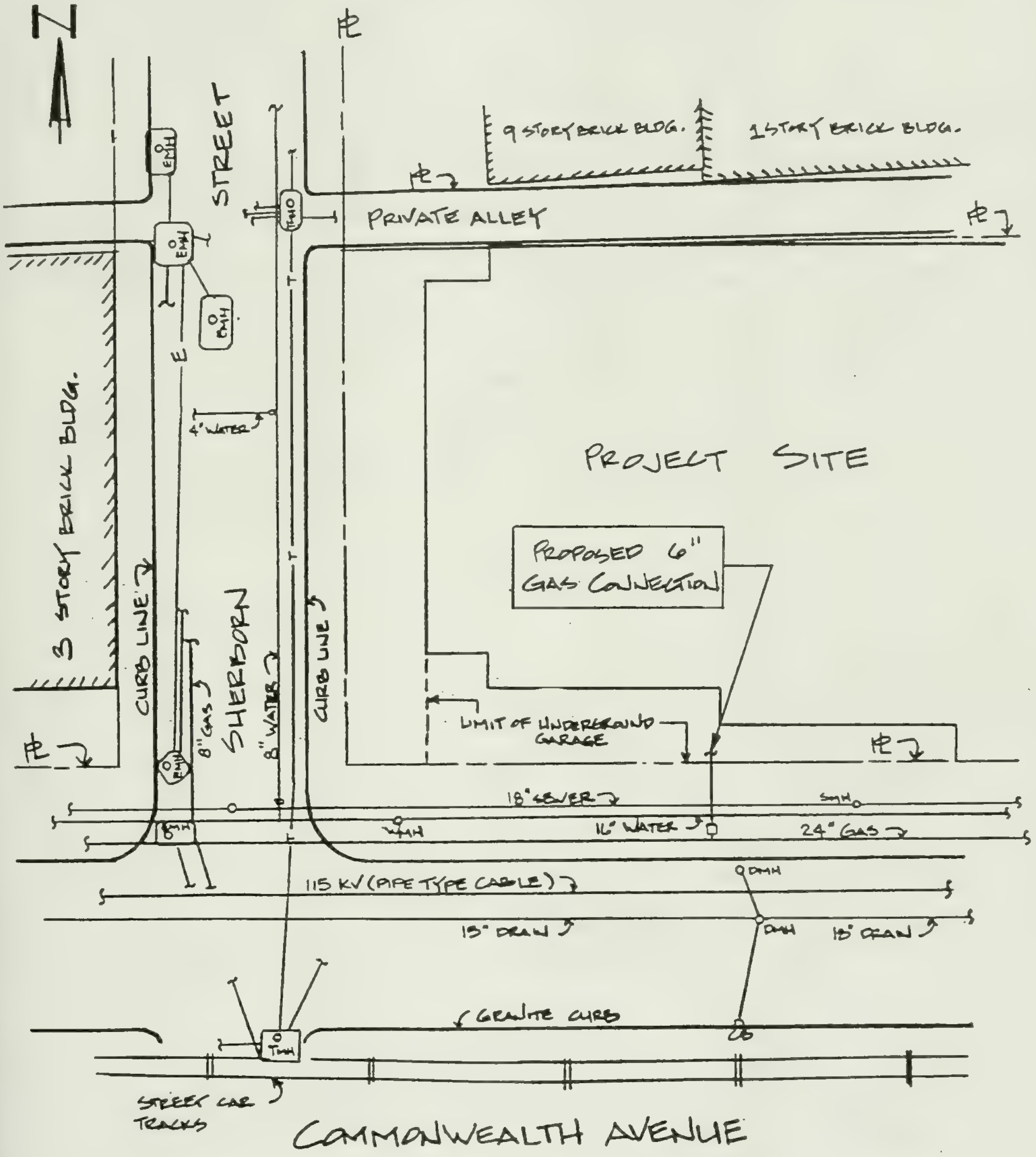
Figure 13-6



Electrical Connections

Prepared By: Amman & Whitney

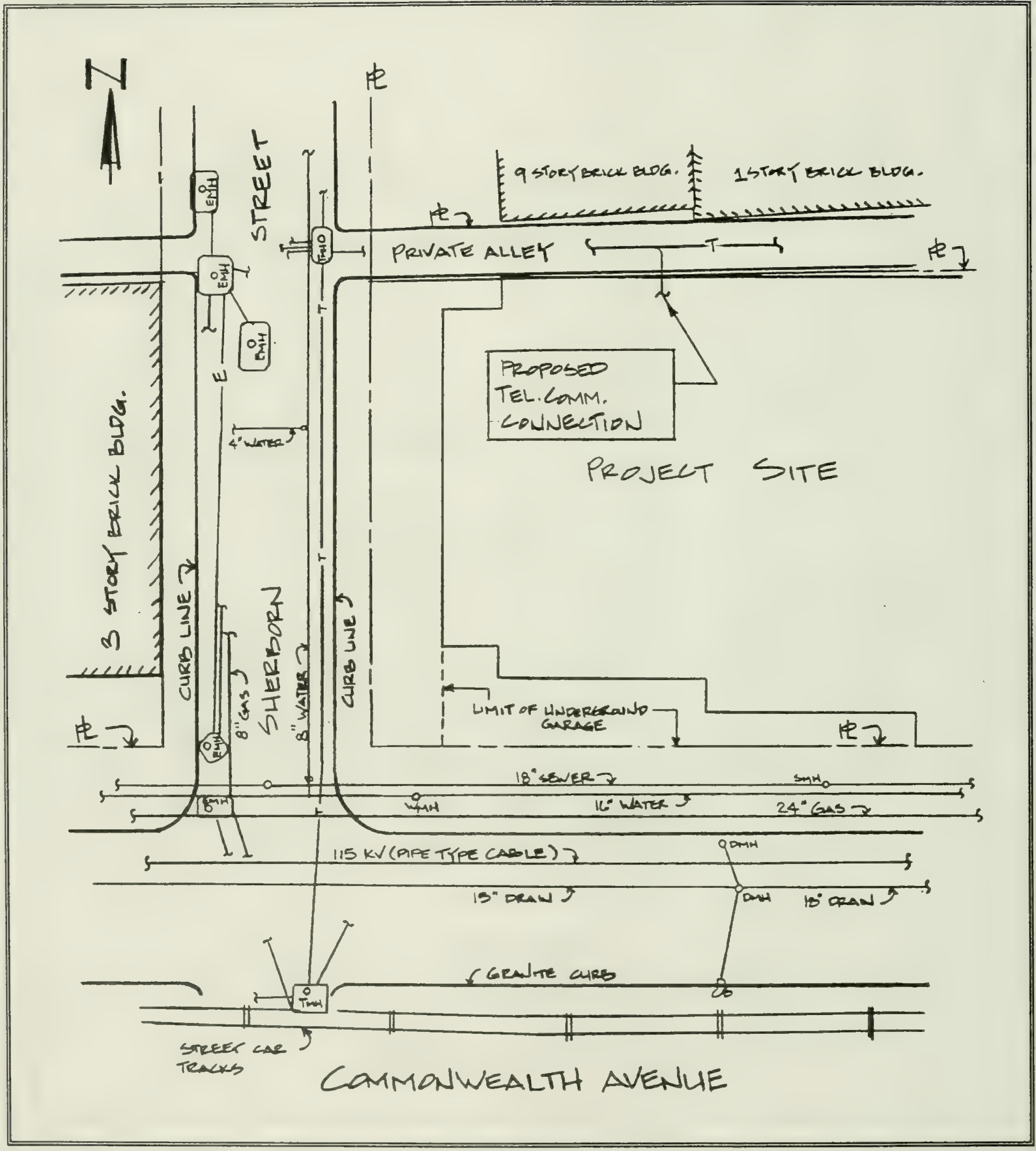
Figure 13-7



Gas Connection

Prepared By:
Amman & Whitney

Figure 13-8



Telephone Connection

Prepared By:

Amman & Whitney

Figure 13-9

14.0 TRANSPORTATION

14.0 TRANSPORTATION

14.1 INTRODUCTION

This chapter discusses the transportation impacts of the Boston University new School of Management project. Analyses were performed for existing and future conditions (1997) to estimate the Project's impacts in terms of vehicle, transit, and pedestrian trips. Analyses for the forecast year were conducted for No-Build and Build conditions. In both cases, other projects which are expected to be completed by the 1997 analysis year have been included in the assessment of future conditions. The information described herein is based on a scoping determination made by the Boston Redevelopment Authority and the Boston Transportation Department dated October 6, 1992, and on the Preliminary Adequacy Determination issued on the Draft PIR dated June 29, 1993.

The ten story project alternative, originally analyzed in the Draft PIR, has since been reduced in height, bulk and square footage to a nine story building. This reduction reduces overall impacts of the Project but does not significantly alter the transportation analyses or impacts. The potential impacts on transportation from the Project are based on the number of parking spaces in the building program and person trips to the site. The number of parking spaces remains the same for both alternatives and the reduced square footage of the building translates into an insignificant reduction in the number of person trips to the site. Therefore, the transportation analyses have not been redone for the nine story alternative and are based on the original ten story alternative program. The Project analysis uses several conservatively high assumptions and still emerges with very small traffic impacts.

The School of Management Site

The new School of Management site is located at 595 Commonwealth Avenue on Boston University's Charles River campus in Boston, Massachusetts. It is currently occupied by two surface parking lots containing 181 spaces. The lots are used by University employees during the day, a limited number of students during evening hours, and Red Sox fans during baseball games. The site is bounded by a private way to the north, Commonwealth Avenue to the south, Sherborn Street to the west, and the Howard Johnson's Motor Lodge to the east.

The Development Proposal

The ten story alternative for the new School of Management project included the construction of approximately 366,000 square feet of building space with 270 below-grade parking spaces. The reduced scale alternative will consist of approximately 227,000 square feet of space serving approximately 3,500 full- and part-time students. Above the new School of Management will be approximately 139,000 square feet of executive administrative offices. A portion of one floor of the new School of Management will include seminar facilities for a new Executive Education Center at the University. It is important to note that, with the exception of the Executive Education Center, the Project is replacing existing facilities on campus. This means that the students, faculty, and staff who will travel to the new building are already traveling to either the existing School of Management on Commonwealth Avenue or other buildings on Boston University's Charles River campus. Virtually no increase in enrollment or employment associated with this development is anticipated on site. Only a very small potential increase in employment may result in vacated space scattered around campus and this is not significant enough to alter assumptions in campus growth or impact analyses. See Chapter 3.0, Urban Design for discussion of re-use of existing space.

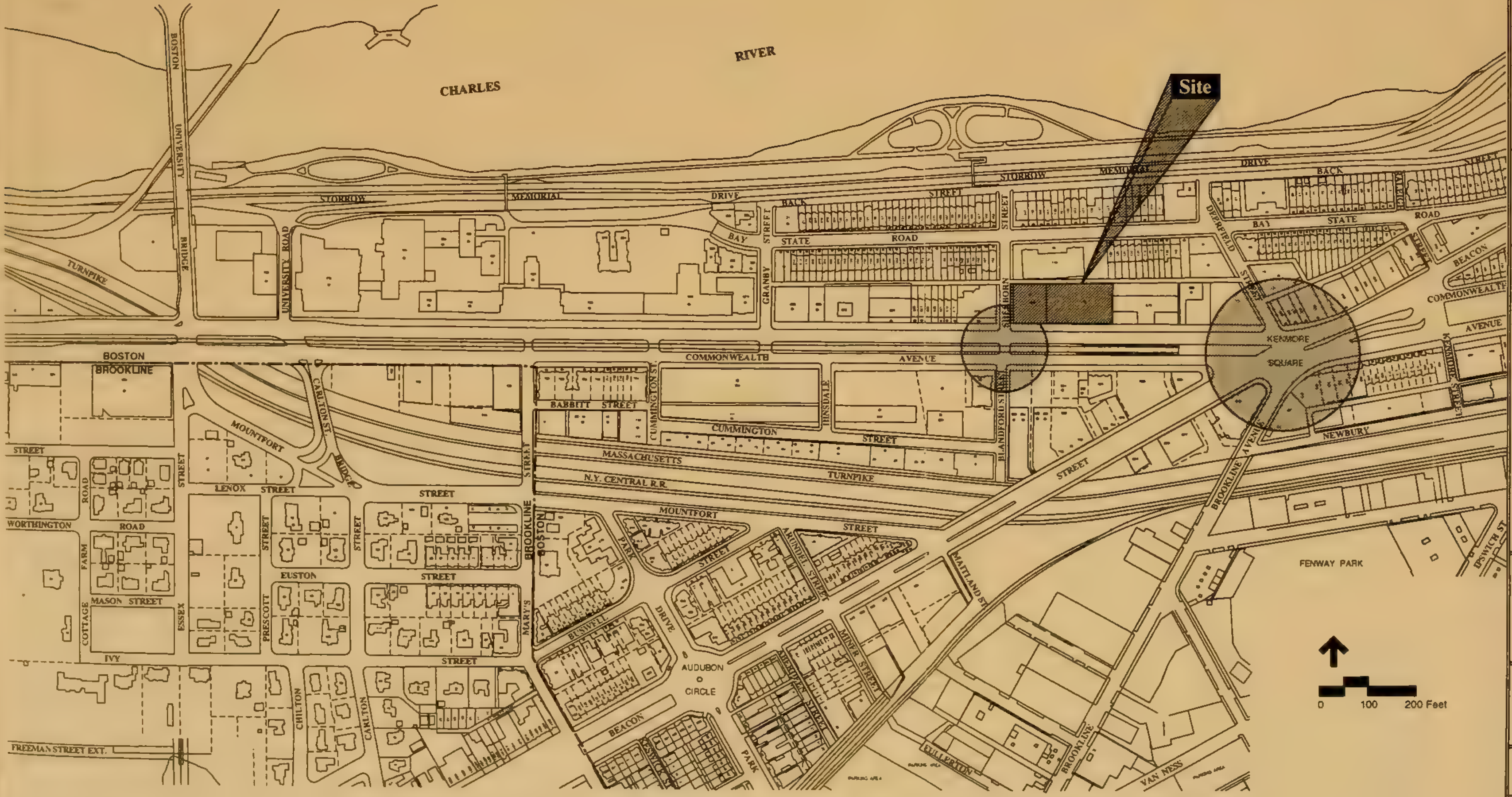
14.2 STUDY AREA

The study area for this Project, for the purposes of assessing traffic, pedestrian, and transit conditions as defined by the Boston Transportation Department, runs along Commonwealth Avenue and is bounded by Kenmore Square to the east and Sherborn Street to the west. The study area for traffic conditions differs from the parking assessment, as described later in this chapter. Two intersections have been designated as analysis locations to measure the traffic impacts of the Project. These intersections and the site location are illustrated in Figure 14-1.

14.3 STUDY METHODOLOGY

This transportation study was conducted in three distinct phases. Phase I involved an inventory of existing conditions and travel demand characteristics in the area. The inventory included researching previous transportation reports as well as conducting new field observations of area travel demands. New observations of traffic and pedestrian volumes were conducted in December 1992. Pedestrian counts were conducted during the morning and evening peak periods at crosswalk locations adjacent to the site. Data collected during the inventory phase were assembled and used to define the existing transportation network as a base condition for subsequent analyses.

Phase II of the study used the data base assembled in Phase I to establish a framework for evaluating the transportation impacts of the Project. In this phase, specific travel demand forecasts for the Project were assessed along with future demand projections associated with known development projects. In addition, because some growth in employment can be anticipated to occur at the University regardless of the Project, estimates of future travel demand were compiled for this growth. Estimates were made for three travel modes: automobile, transit, and pedestrian. The year 1997 was selected as the analysis year to be consistent with guidelines



BOSTON UNIVERSITY
SCHOOL OF MANAGEMENT

Traffic Analysis Locations

Figure 14-1

Prepared By:
Vanasse Hangen Brustlin, Inc.

August 1993

for the preparation of transportation analyses established by the Commonwealth's Executive Office of Transportation and Construction.

Phase III, the final study phase, included evaluation of the impacts of the Project on the transportation system, identification of measures to mitigate impacts, and development of a monitoring program.

14.4 SUMMARY OF FINDINGS

Because the new School of Management project will replace existing facilities on the campus, it will not result in a significant increase in the population of students, faculty, or staff on the Project site or campus wide. On a daily basis, the Project is expected to generate a total of approximately 228 net new vehicle trips. Approximately 57 of these trips are expected to occur in each of the morning and evening peak hours. Two signalized intersections in the vicinity of the Project site were analyzed for traffic impacts. The analysis showed that both intersections operate at Level-of-Service (LOS) D or better under existing conditions. In the future, under No-Build conditions, the Kenmore Square intersection is forecast to decline to LOS E from LOS D during the morning peak hour. No decline in LOS or degradation of intersection operations is anticipated as a result of the Project. See Table 14-2 for LOS criteria.

Parking spaces included in the Project will serve the activities associated with the Project. The Project is not anticipated to result in any significant increase in parking demand. On days when average-attendance training seminars are occurring (about 80 participants) it is estimated that up to 40 parking spaces would be needed. This additional demand will be accommodated on the site. A few times per year, the Executive Education Center will be used to its full capacity (240 participants) which is estimated to demand up to 120 parking spaces. On these occasional days, the University will park attendees at the site and at other nearby locations such as the Bay State Road lot, the 700 Commonwealth Avenue garage, and elsewhere.

The new School of Management is forecast to generate a total of 750 transit trips per day. Fewer than 100 of these trips will be new to the Charles River campus and, therefore, the impacts on transit operations will be negligible.

The mitigation plan identified for this development includes transportation demand management strategies, construction management measures and other efforts aimed at properly managing the development and the area transportation system.

14.5 EXISTING CONDITIONS

Traffic

The following inventory of roadway characteristics, intersection geometry and operating conditions, traffic volumes, and levels of service was compiled as part of the Phase I data collection process.

Roadway Network

The Project site is located approximately two and one half miles from downtown Boston and is accessible from Commonwealth Avenue, Storrow Drive/Soldiers Field Road and Memorial Drive via the Boston University Bridge. It is also accessible from the Massachusetts Turnpike (I-90) at the Allston/Cambridge interchange. These street systems are more specifically described below:

Commonwealth Avenue is a four- to six-lane, divided, urban arterial that connects to the west at the terminus of State Route 30 in Brighton and to the east at the Public Garden in downtown Boston. The site is located along this corridor near its eastern terminus.

Storrow Drive/Soldiers Field Road is a four-lane, divided, limited-access parkway which runs in an east/west direction along the southern bank of the Charles River, connecting downtown Boston to many of the inner western suburbs, including Newton, Watertown, West Cambridge, Brighton, and Arlington. Connections to the site from this facility are limited. Access from the east and west is provided at the Charlesgate interchange via Kenmore Square. Egress to the east is also provided by an intersection with University Road.

Memorial Drive is a four-lane, east/west parkway running between Cambridge and Watertown along the northern bank of the Charles River. It provides an alternative route to and from the University by way of the Boston University Bridge for traffic originating in downtown Boston, Cambridge, Logan Airport, and the northern suburbs.

The Massachusetts Turnpike (I-90) is a six-lane, east/west, limited access highway. It runs from western Massachusetts to downtown Boston, where it connects to the Southeast Expressway (I - 93/State Route 3). Although the site is only approximately one quarter mile from this facility, there is no direct access in the immediate vicinity. There is, however, an interchange at the Allston and Cambridge boundary where ramps from the Turnpike intersect with Cambridge Street and Soldiers Field Road. Motorists exiting the Turnpike can reach the site by way of Soldiers Field Road and Storrow Drive via Kenmore Square. Motorists exiting the site destined for the Turnpike would likely travel eastbound on Commonwealth Avenue, turn right onto Massachusetts Avenue, and access the Turnpike via an on-ramp at the intersection of Massachusetts Avenue and Newbury Street.

Figure 14-2 presents a summary of the traffic patterns and controls in the vicinity of the site and at the study area intersections. It should be noted that no left turn is permitted from Commonwealth Avenue eastbound onto Sherborn Street. Motorists wishing to access the site must make a U-turn just west of Kenmore Square.

Traffic Volumes

Existing traffic volumes were counted manually and mechanically at key locations in the study area in 1992. The following paragraphs present information on both daily and peak hour traffic characteristics as well as a discussion of the traffic currently entering and exiting the site parking lots.

Daily Traffic Volumes

To measure the level of traffic currently passing in front of the site, automatic traffic recorders were placed on both sides of Commonwealth Avenue during the week of May 4, 1992. The counts indicated the following weekday traffic volumes:

Eastbound	15,500 vehicles per day
Westbound	16,900 vehicles per day
Total	32,400 vehicles per day

By way of comparison, traffic counts conducted for the 899-925 Commonwealth Avenue development, located just west of Buick Street and west of the Boston University Bridge, showed that Commonwealth Avenue carried 44,350 vehicles daily west of the Boston University Bridge and 30,400 vehicles east of University Road in 1987.

Existing Site Traffic and Parking Characteristics

As mentioned previously, there is a total of 181 parking spaces currently located on the site. These spaces are used by full-time University employees and are not available for public parking during the day. Some turnover, however, does occur during the day. For the purposes of estimating exiting traffic patterns, based on information provided by the Office of Parking Services at the University, it has been assumed that twenty percent of the spaces are vacated and re-occupied once over the course of a typical day. Based on these assumptions, Table 14-1 presents an estimate of the existing vehicle trips to and from the two parking lots on a daily basis, including evening student vehicle trips and Red Sox parking vehicle trips when weekday evening games occur.

In summary, it is estimated that there are a total of approximately 464 vehicle trips to and from the Project site on weekdays when no Red Sox games are held and 796 total vehicle trips on Red Sox game days.

Table 14-1
Existing Daily Vehicle Trips To and From Project Site

Category	Number of Trips
Estimated daytime entering trips	181
Estimated daytime exiting trips	181
Subtotal	**362**
Assumed 20 percent turnover	72
Subtotal Daytime Trips	**434**
15 evening student trips in	15
15 evening student trips out	15
Total Daily Trips On Non-Red Sox Game Days	**464**
181 Red Sox parker trips in	181
181 Red Sox parker trips out	181
Less evening student trips diverted elsewhere	-30
Total Daily Trips On Red Sox Game Days	**796**

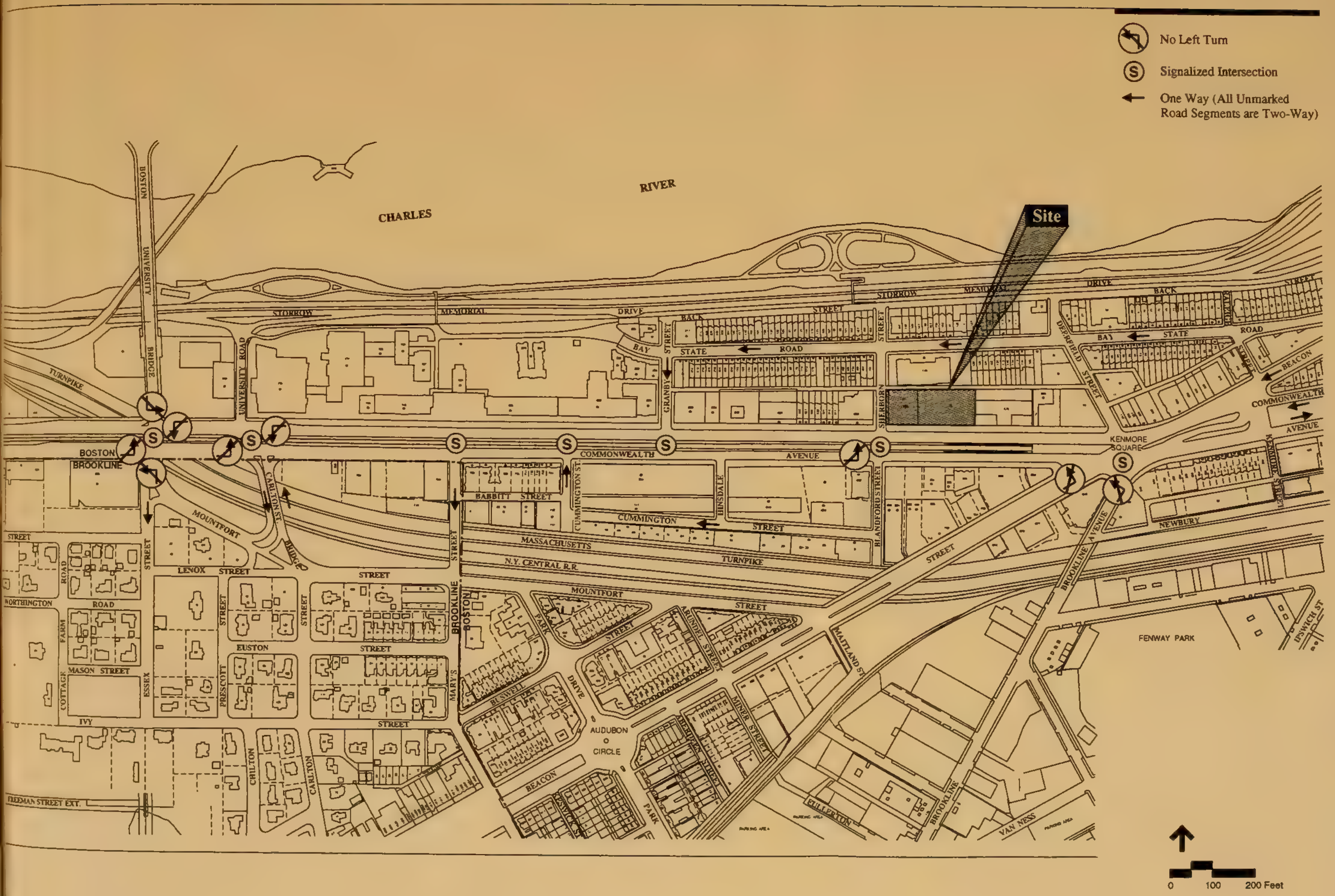
Source: Vanasse Hangen Brustlin, Inc. and Boston University

Peak Hour Traffic Volumes

Manual turning movement counts were conducted in December 1992 at two intersections during the morning (7:30 AM to 9:00 AM) and evening (4:30 PM to 6:00 PM) peak periods. Peak hour traffic volumes are shown in Figures 14-3 and 14-4.

Level-of-Service Analysis

To assess the ability of an intersection to process traffic, an existing conditions operations analysis was performed. To measure the quality of traffic operation, two intersections within the study area were analyzed with regard to capacity and delay. These intersections were specified in the scope issued by the Boston Transportation Department.



BOSTON UNIVERSITY
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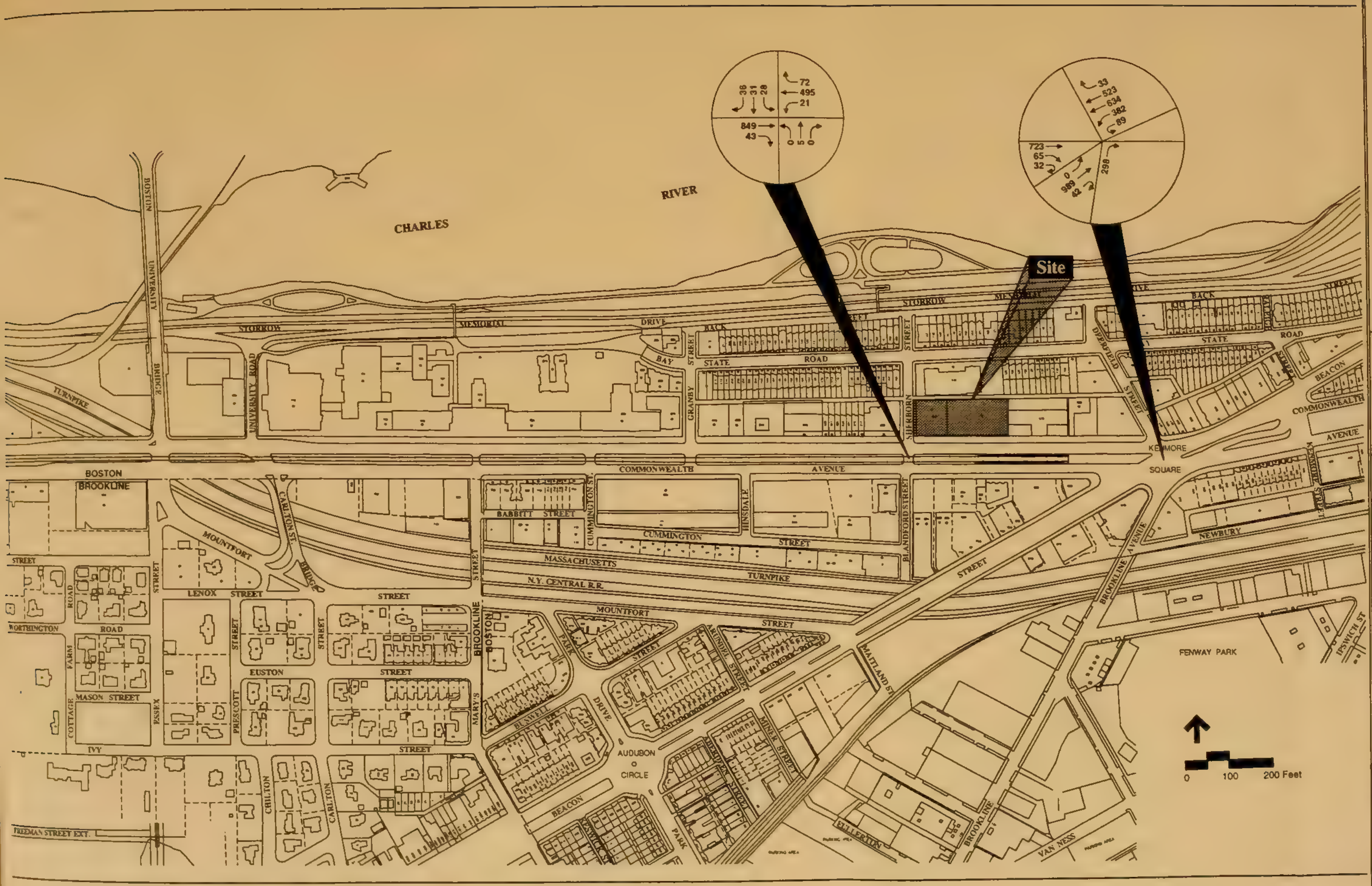
Existing Roadway Circulation and Traffic Controls

Figure 14-2

Prepared By:
Vanasse Hangen Brustlin, Inc.

August 1993



BOSTON UNIVERSITY

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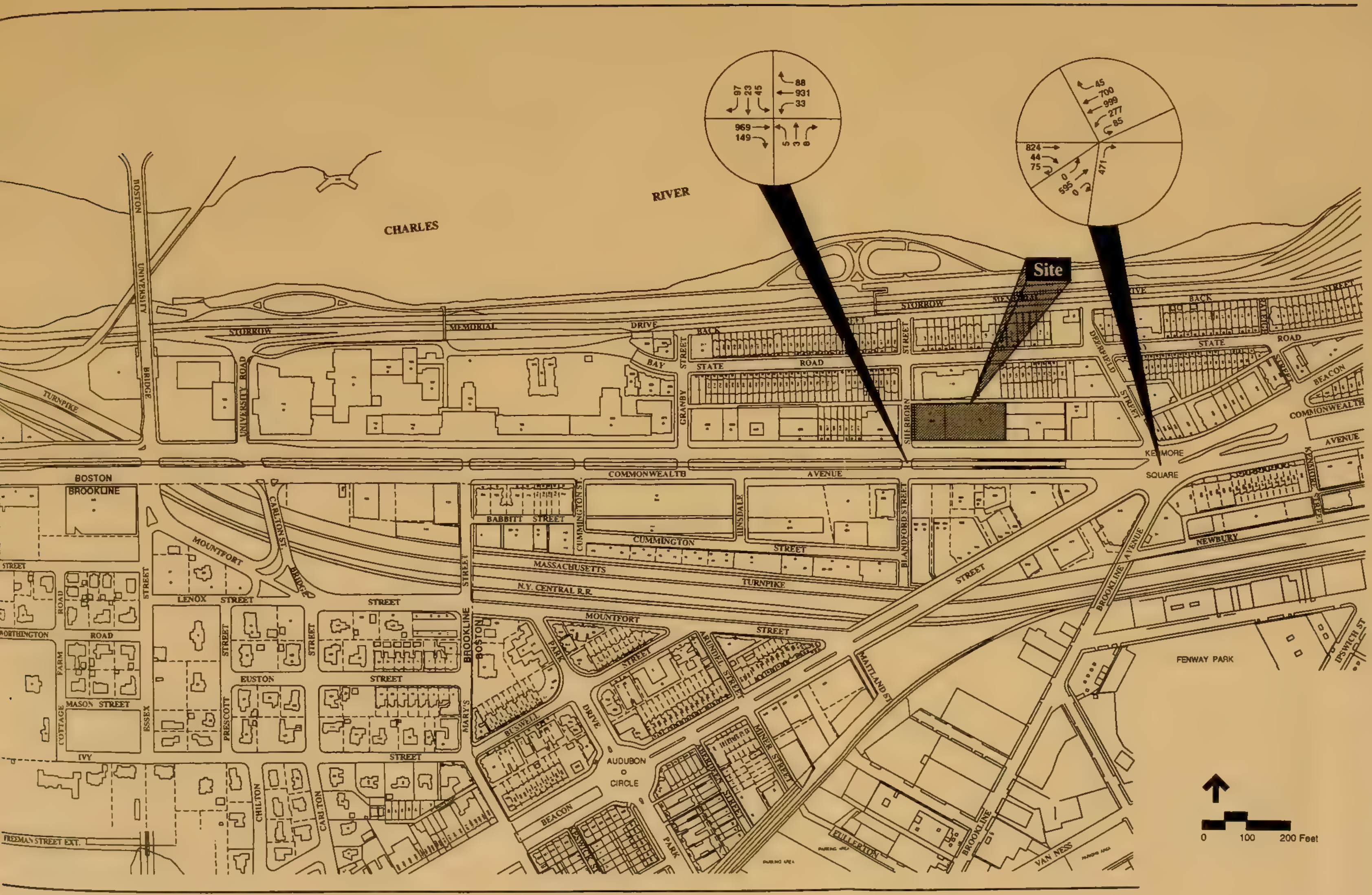
1992 Existing AM Peak Hour Traffic Volumes

Figure 14-3

Prepared By:
Vanasse Hangen Brustlin, Inc.

August 1993



BOSTON UNIVERSITY

SCHOOL OF MANAGEMENT

1992 Existing PM Peak Hour Traffic Volumes

Figure 14-4

Prepared By:
Vanasse Hangen Brustlin, Inc.

August 1993

A primary result of a capacity analysis is the assignment of levels of service to transportation facilities under various traffic flow conditions. The concept of LOS involves a qualitative measure describing operating conditions within a traffic stream and perceptions by motorists. A LOS definition generally describes these conditions in terms of factors such as speed and travel time, freedom to maneuver, traffic interruptions, comfort and convenience, and safety. It provides an index to the quality of traffic flow.

Signalized Intersection Level-of-Service Analysis Procedure

Levels of service for signalized intersections are calculated using the operational analysis methodology of the 1985 Highway Capacity Manual (HCM).[1] This method assesses the effects of signal type, timing, phasing, progression, vehicle mix, and geometrics on delay. LOS designations are based solely on the criterion of average stopped delay per vehicle, since delay is a measure of driver discomfort, frustration, fuel consumption, and increased travel time. Table 14-2 summarizes the relationship between LOS and delay. The tabulated delay criteria may be applied in assigning LOS designations to individual lane groups, intersection approaches, or to entire intersections. Throughout this chapter, delays and LOS are reported for intersections as a whole.

Table 14-2
Level-of-Service Criteria for Signalized Intersections

Level-of-Service	Stopped Delay per Vehicle (seconds)
A	<5.0
B	5.1 to 15.0
C	15.1 to 25.0
D	25.1 to 40.0
E	40.1 to 60.0
F	>60.0

Source: Highway Capacity Manual

These calculated delays cannot be directly related to intersection capacity. It is possible to have delays in the LOS F range without exceeding capacity. This is possible if one or more of the following conditions exists:

- Long signal cycle lengths.
- A particular traffic movement experiences a long red time.

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[1] Highway Capacity Manual, Special Report 209, Transportation Research Board, Washington, DC, 1985.

- Progressive movement for a particular lane group is poor.

For the reasons stated above, both capacity and LOS must be carefully examined when analyzing a signalized intersection. The designation of an approach as operating at LOS F does not automatically imply that the entire intersection, approach, or lane group is overloaded, nor does a LOS in the A to E range automatically indicate that there is unused capacity available. LOS analyses for signalized intersections were conducted using a computer program (CINCH)[2] based on the 1985 Highway Capacity Manual. Detailed analysis results are presented in the Appendix D, Transportation.

Signalized Intersection Level-of-Service Results

LOS analyses for morning and evening peak-hour traffic operations were conducted for the two signalized intersections in the study area. Table 14-3 summarizes the results of the analysis.

As indicated in Table 14-3, traffic operations at the two study area intersections are acceptable for urban intersections (LOS D or better). In both peak hours, the intersection of Commonwealth Avenue with Sherborn Street and Blandford Street operates at LOS B. At Kenmore Square, the LOS in the morning peak hour is D and in the evening peak hour, C.

Table 14-3
Existing Level-of-Service - Signalized Intersections

	Morning Peak Hour			**Evening Peak Hour**		
Intersection	V/C*	Delay**	LOS***	V/C	Delay	LOS
Commonwealth Ave. and Sherborn St./Blandford St.	0.48	8	B	0.62	12	B
Commonwealth Ave., Beacon St., and Brookline Ave.	0.86	36	D	0.83	21	C

* Volume-to-capacity ratio.
** Average stopped delay per vehicle (in seconds).
*** Level-of-Service.

Source: Vanasse Hangen Brustlin, Inc.

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[2] The Capacity of Intersections: CTPS's HCM Software (CINCH), Central Transportation Planning Staff, 1987.

Parking

1986 Charles River Campus Parking Study

Boston University commissioned a comprehensive parking study of its Charles River Campus in 1985-1986.[3] The parking study included a detailed inventory of available parking spaces campus-wide, an assessment of campus parking requirements, strategies to improve the parking system, and other recommendations. The major findings of the report were as follows:

- The total on-campus parking supply consisted of 2,473 spaces. More than 2,000 of these spaces were located in thirteen off-street facilities distributed throughout the campus. The remaining off-street spaces were located behind and adjacent to campus buildings.

- On a typical weekday, parking demand at the University peaks at approximately 11:00 AM. Parking demand at this hour was estimated to total 2,905 spaces, exceeding the available supply at University-controlled facilities (2,473 spaces) by 432 vehicles.

- The total supply of off-street spaces (2,473 spaces) when added to the curbside parking supply used by the University community (270 spaces throughout the campus) provided an overall total supply of 2,743 spaces. Adjusting to account for inefficiencies resulting from turnover activities, the estimated capacity of the University parking system was reduced to 2,572 spaces, including the on-street public spaces. Relative to this adjusted capacity, the estimated peak period parking deficit was 333 spaces (2,905 space demand minus 2,572 space-adjusted supply). Demand exceeded adjusted capacity by 200 or more spaces from 9:00 AM through 4:00 PM on a typical weekday.

- The area west of the Boston University Bridge had a surplus of parking spaces, even during peak periods. On the Central Campus, however, it remained exceedingly difficult to locate vacant parking spaces between 9:00 AM and 4:00 PM.

1992 Charles River Campus Parking Supply

The current parking supply managed by the University's Office of Parking Services contains a total of 3,146 spaces campus-wide. This represents an increase of 659 new spaces plus management of 154 spaces from commercial lots over the 1986 supply of spaces managed by Parking Services. Major changes to the parking supply since the 1986 study include:

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[3] Boston University Campus Parking Plan, Technical Report, prepared by Vanasse Hangen Brustlin, Inc., June 1986.

- 547 spaces were added at 899-925 Commonwealth Avenue on the site of the former Commonwealth Armory (relocation of the National Guard);
- 56 spaces were added in the Electrocom Area (Babcock Annex) on Babcock Street;
- 56 spaces were added in the Sherborn Lot (599 Commonwealth Avenue, the Project site);
- 88 spaces were eliminated as a result of the loss of the Morse Auditorium parking area, formerly located at 602 Commonwealth Avenue, due to the construction of the Physics and Biological Sciences Building;
- 56 spaces were eliminated from two lots on Cummington Street;
- 18 spaces were eliminated at 635 Commonwealth Avenue.

The University acquired commercially operated lots at 10 Deerfield Street, containing 116 spaces, and 730 Commonwealth Avenue, containing 38 spaces. While these spaces are new to the University system, they are not new to the parking supply in the area.

Since the 1986 study, the University has also acquired parking spaces on the roof of 120 Ashford Street, but these spaces are currently closed and are not included in the inventory because the cost of repairs and their location at the west end of the campus mean they likely will not be reopened. It should also be noted that in addition to the changes to the campus supply, approximately 300 spaces have been added to the public supply of off-street spaces at 730-766 Commonwealth Avenue. This is the site of the former Back Bay Motors facility which is leased on a long-term basis by the University which, in turn, sub-leases the property to Stanhope Garage, Inc. for public parking. These 300 spaces are currently priced at $5.00 per day, which is $1.00 per day less than the pay-on-entry rate of $6.00 charged in University facilities.

Project Area Parking Supply

In general, most spaces within the Project area are used to capacity throughout the day, as noted earlier. The University has, therefore, continued to seek additional parking capacity for users of its facilities. The goal is to provide a sufficient supply of conveniently located spaces to serve the Project, thereby, minimizing pressure on nearby residential areas while simultaneously encouraging use of public transportation services and carpooling.

Because the Boston University campus is long and linear, there are significant distances between parking locations and it is recognized that parking facilities at one end of campus do not readily serve activities at the other end. Therefore, a parking study area was defined to discuss parking conditions around the Project site. This parking study area is bounded by Deerfield Street, Bay State Road, Granby Street, and Cummington Street. The off-street and on-street parking spaces are described below.

Off-Street Parking Supply

Figure 14-5 shows the location, type and number of spaces in existing off-street parking facilities controlled by the University. Spaces in alleys and driveways are not shown. Table 14-4 presents additional information about each facility. As shown, there are 1,171 off-street parking spaces composed of 180 spaces in commercial parking areas, 430 spaces in employee-only parking lots, and a 561-space garage located beneath the Warren Towers dormitory complex. According to the University's Office of Parking Services, these spaces, with the exception of the commercial lot on Deerfield Street, are used to capacity throughout the course of the day. The employee lots experience very little turnover, meaning that employees generally enter the facility in the morning, park all day, and leave in the evening.

Within the parking study area the University has closed several parking facilities. This includes the Morse Auditorium lot (88 spaces), two parking lots on Cummington Street (containing a total of 56 spaces), and the lot at 635 Commonwealth Avenue (18-spaces). In total, 162 spaces within a few blocks of the Project site have been closed over the past decade.

Table 14-4
Off-Street Parking Supply in Development Areas

Facility Type	**Licensed Capacity**
Commercial Lots	
10 Deerfield Street	116
665 Commonwealth Avenue	64
Subtotal	**180**
Employee Lots	
30 Deerfield Street	69
591-595 Commonwealth Avenue (Project Site)	125
599 Commonwealth Avenue (Project Site)	56
Bay State Road SMG Parking Area	180
Subtotal	**430**
Garage	
700 Commonwealth Avenue	561
TOTAL	**1,171**

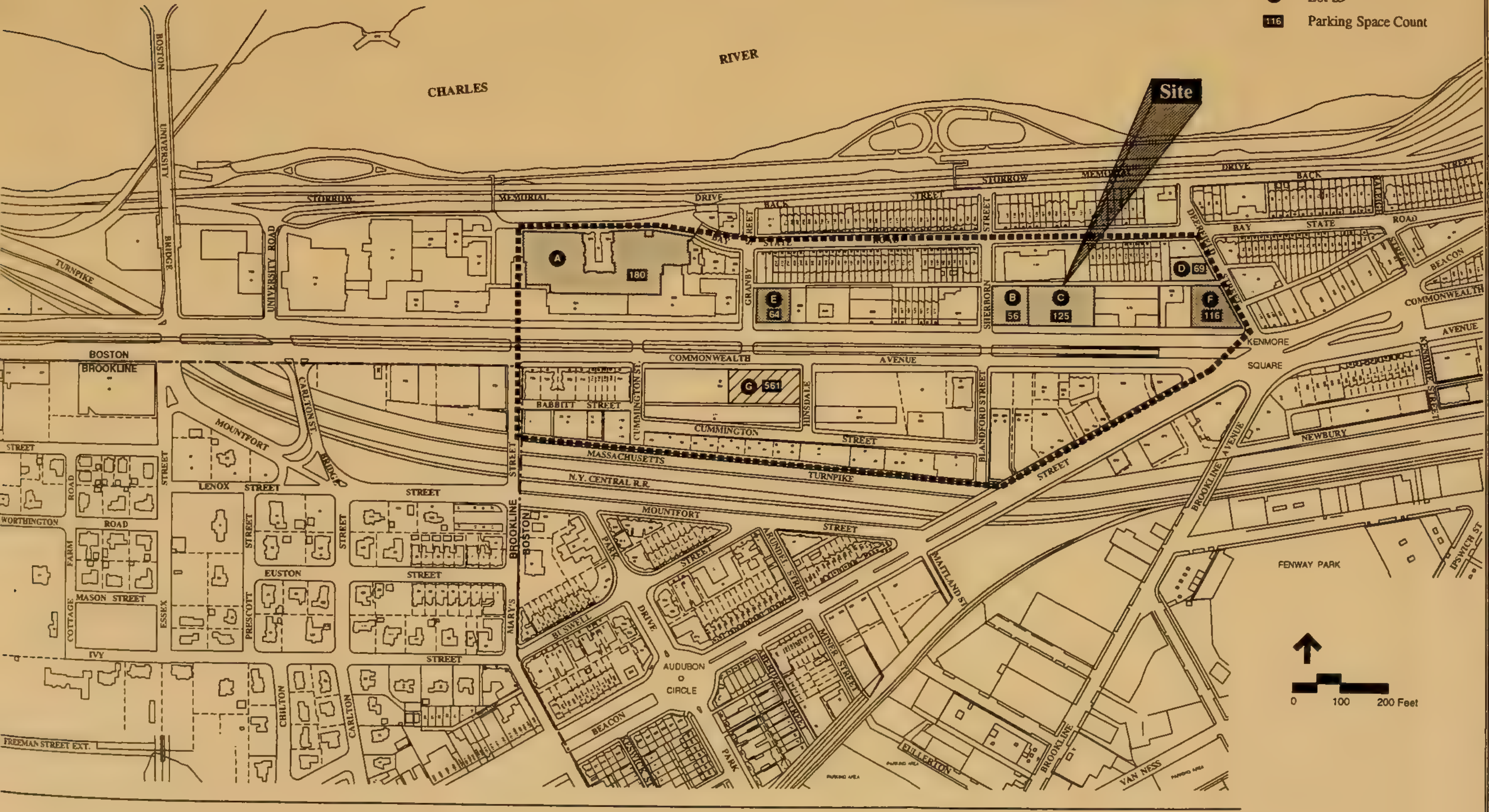
Source: Boston University

GARAGE		
ID	LOCATION	SPACES
G	700 Commonwealth Ave.	561
TOTAL SPACES		561

COMMERCIAL LOTS		
ID	LOCATION	SPACES
E	665 Commonwealth Ave.	64
F	10 Deerfield St.	116
TOTAL SPACES		180

EMPLOYEE LOTS		
ID	LOCATION	SPACES
A	S M G	180
B	599 Commonwealth Ave.	56
C	595 Commonwealth Ave.	125
D	30 Deerfield St.	69
TOTAL SPACES		430

☐ Employee Lot
▨ Commercial Lot
▨ Garage
■■■■ Study Area
● Lot ID
■ Parking Space Count



BOSTON UNIVERSITY

SCHOOL OF MANAGEMENT

Study Area Off-Street Parking Supply

Figure 14-5

Prepared By:
Vanasse Hangen Brustlin, Inc.

August 1993

On-Street Parking Supply

Curbside parking is provided throughout the Boston University campus. Within the development study area, there are a total of 498 curbside spaces, as illustrated in Figure 14-6. As shown, this consists of 340 four-hour meters located on and west of Sherborn/Blandford Street and 142 two-hour meters located between Deerfield Street and Sherborn/Blandford Street. In addition, there are four handicapped spaces located on Cummington Street and 12 unmetered spaces in various locations. These spaces are well utilized throughout the course of the day. In the 1986 study, over 92 percent of on-street spaces were occupied overall during the course of the day. As expected, spaces with four-hour time limits were more heavily utilized than spaces with two-hour time limits. In fact, the only vacant parking spaces observed were in two-hour limit spaces. Mid-day field observations conducted in December 1992 showed high use of these spaces.

Parking on the Project Site

The new School of Management will be constructed on two University employee parking lots located on the north side of Commonwealth Avenue east of Sherborn Street. These lots contain a total of 181 employee parking spaces and are currently served by five separate curbcuts. According to the University's Office of Parking Services, these lots are in high demand. They essentially fill in the morning, stay full throughout the day, and empty in the late afternoon. There is virtually no daytime turnover in these lots.[4]

In addition to serving the employees who park there during the day, these parking lots also serve two other groups of parkers. During the evening, students who travel to the University for evening classes park in these and other areas. The University's Office of Parking Services estimates that up to 15 students park in these lots on any given weekday evening when classes are held. Otherwise, most of the spaces are vacant during the evening. The second use is for Red Sox parking. On Red Sox game days, the lots are once again filled to capacity. On the evening of Red Sox games, student parking is accommodated in other facilities not used for Red Sox parking.

Existing Parking Rates

Boston University charges $50 per month for employee parking spaces. This amount is typically collected through payroll deduction. Parkers in the commercial lots on Commonwealth Avenue and Deerfield Street are charged $2 per half hour up to a daily maximum of $7. For patrons of the Boston University Bookstore, two hours of free parking are provided in the 10 Deerfield lot with validation. At the Lahey lot (Project site), if spaces are available, public parkers may pay $6 on entry during the day. For Red Sox games, $12 is charged for parking.

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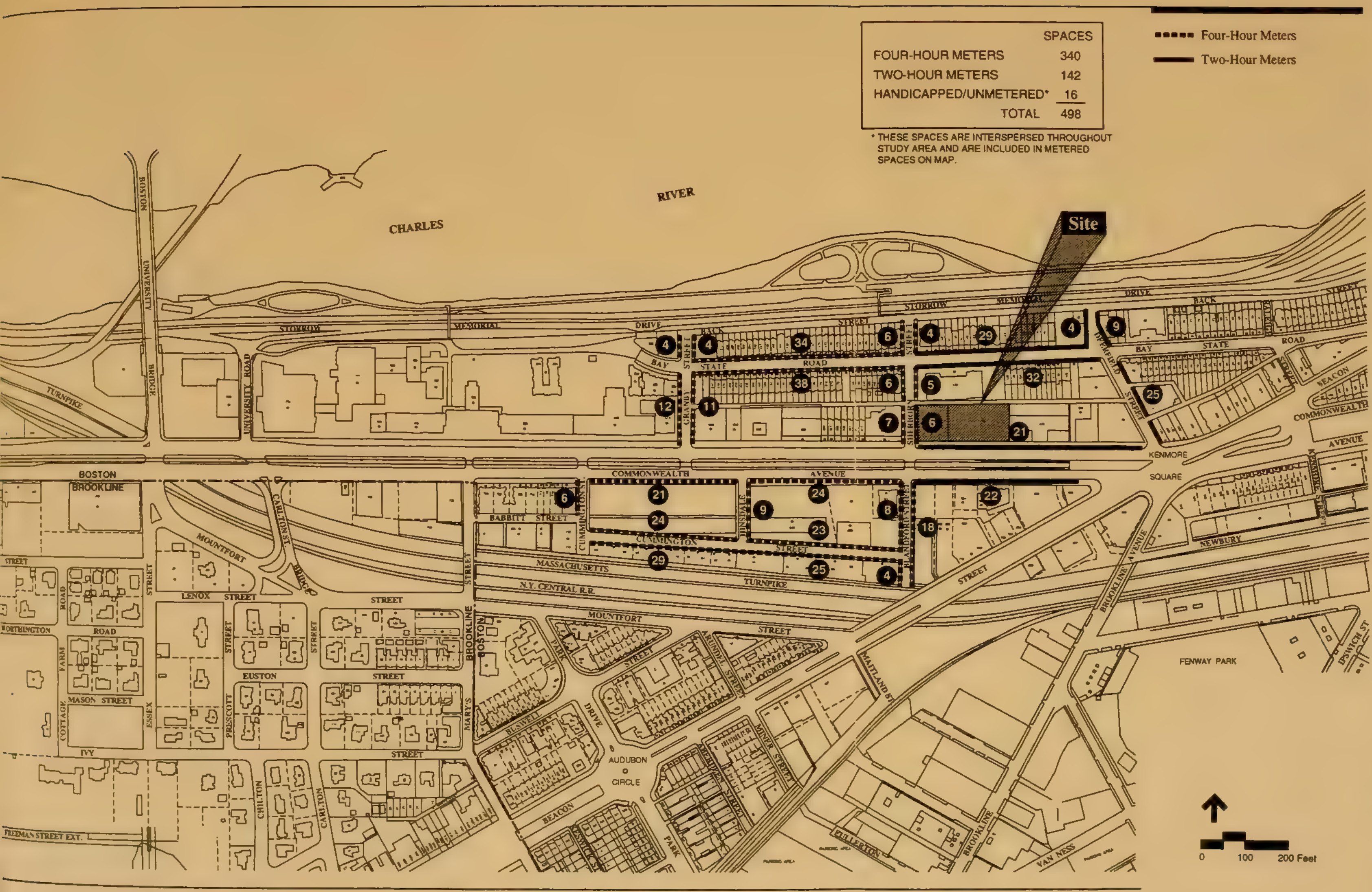
[4] For a more conservative traffic analysis, however, it was assumed that 20 percent of the spaces turn over during the day.



	SPACES
FOUR-HOUR METERS	340
TWO-HOUR METERS	142
HANDICAPPED/UNMETERED*	16
TOTAL	498

* THESE SPACES ARE INTERSPERSED THROUGHOUT STUDY AREA AND ARE INCLUDED IN METERED SPACES ON MAP.

BOSTON UNIVERSITY

SCHOOL OF MANAGEMENT

Study Area On-Street Parking Supply

Figure 14-6

Prepared By:
Vanasse Hangen Brustlin, Inc.

August 1993

Public Transportation

The Massachusetts Bay Transportation Authority (MBTA) operates one light rail trolley line and two bus lines which directly serve the study area and development site. Service is provided every day of the year for at least 18 hours per day. No service is offered from 1:30 AM to 5:00 AM. The routes of these services are illustrated in Figure 14-7. Table 14-5 presents their scheduled frequencies and capacity.[5]

Light Rail

The light rail line, known as the "B" branch of the MBTA Green Line, provides service to the study area along an at-grade, exclusive right-of-way located in the median of Commonwealth Avenue. The service continues outbound from the study area to the Boston/Newton border, where it terminates near Boston College. Going inbound from the study area, the service drops below-grade where it connects to the "C" and "D" branches of the Green Line system at the Kenmore Station, located below Kenmore Square. The service continues inbound below-grade, where passengers can access downtown Boston at numerous locations and can connect to other rapid transit, bus, and commuter rail lines that serve much of Eastern Massachusetts.

Bus Service

Bus Route numbers 47 and 57 also serve the study area. Bus Route 47 operates between Central Square in Cambridge and Boston City Hospital in the South End. It crosses the Boston University Bridge and serves the western portion of the study area. Bus Route 57 provides service between Watertown Square and Kenmore Square, traveling via Brighton Avenue and Commonwealth Avenue. The service was originally created as a temporary replacement for the "A" branch of the MBTA Green Line, which is no longer in service. The bus service operates as a semi-express route through the study area, not allowing eastbound passengers to board nor westbound passengers to discharge along Commonwealth Avenue.

Trolleys used along the Green Line have a capacity of 130 passengers per car. Trolleys consist of two cars during peak periods and one car during the off-peak. Based on current operations, this service provides a capacity of approximately 2,210 passengers per hour during peak periods in the morning and evening.

The typical bus used on Routes 47 and 57 has a seating capacity of 40 passengers. Its normal carrying capacity (used for service planning) is 60 passengers, although greater loads can be accommodated under "crush" conditions. Based on the scheduled headways, these bus routes have a combined total planning capacity of approximately 600 passengers in the morning peak hour and 720 passengers in the evening peak hour.

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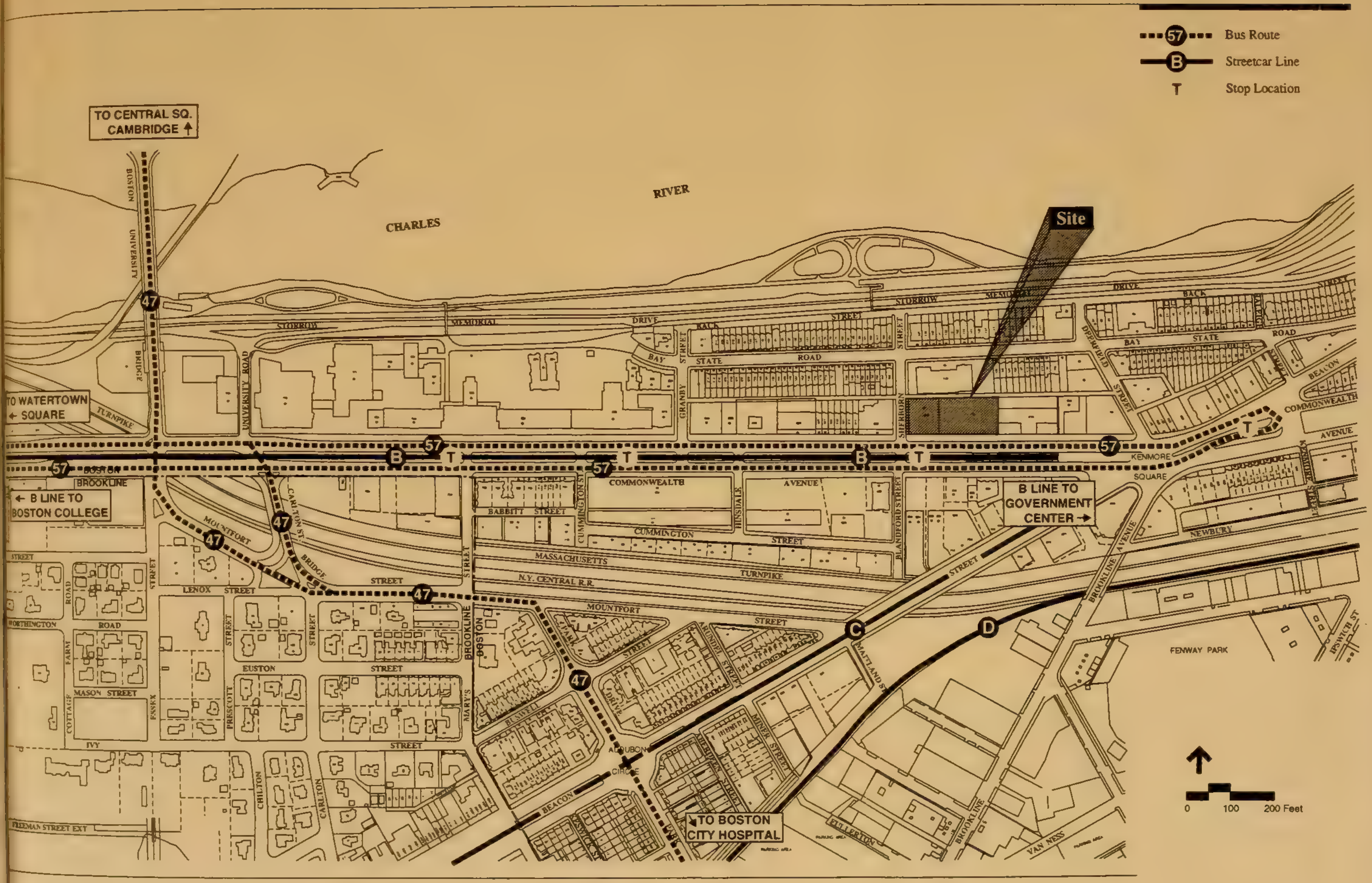
[5] The word "capacity" as used in this discussion of bus transportation refers to the MBTA's "planning capacity", a function normal carrying capacity (40 seated plus 20 standees) and route headway times.



BOSTON UNIVERSITY
SCHOOL OF MANAGEMENT

Location of Public Transportation

Figure 14-7

Prepared By:
Vanasse Hangen Brustlin, Inc.

August 1993

Table 14-5
MBTA Transit Services

	"B" Line	Bus 47	Bus 57
Morning Peak Hour (Peak Direction):			
Vehicle Capacity (Riders)	130	60	60
Vehicles Per Hour	17*	3	7
Hourly Planning Capacity of Line	2,210	180	420
Evening Peak Hour (Peak Direction):			
Vehicle Capacity (Riders)	130	60	60
Vehicles Per Hour	17*	3	9
Hourly Planning Capacity of Line	2,210	180	540

*Rounded to nearest car.

Source: Vanasse Hangen Brustlin, Inc. & Massachusetts Bay Transportation Authority

Boston University Shuttle Bus Service

In addition to service offered by the MBTA, Boston University operates two shuttle bus routes when classes are in session. One route operates as an internal circulation service for the campus, providing service between 1266 Commonwealth Avenue west of the study area and Kenmore Square. This route provides thirty-minute headways during peak periods and one-hour headways during midday and evening hours. Approximately 700 passengers are carried by this service daily. The other route connects the Charles River (Main) campus with the University Medical School and University Hospital, located in the South End. It provides six daily trips (8:00 AM, 11:00 AM, 1:30 PM, 3:30 PM, 6:30 PM, and 8:00 PM).

Pedestrians

Due to the high volume of pedestrian traffic and vehicular traffic throughout the campus, pedestrian safety is a major concern to the University and the City of Boston. This section presents a summary of pedestrian volumes in the vicinity of the site as well as a discussion of pedestrian safety issues.

Pedestrian Volumes

Pedestrian counts were conducted in January 1993, during the morning (7:00-9:00 AM) and evening (4:00- 6:00 PM) commuter peak periods at the intersection of Commonwealth Avenue and Sherborn Street/Blandford Street.

Figure 14-8 presents the pedestrian volumes at this intersection in the morning peak hour. As shown, the highest north-south volume (212 pedestrians) was found to be crossing Commonwealth Avenue between the MBTA tracks in the median and Blandford Street, with the dominant flow toward the south. The highest east-west volume occurred adjacent to the Project site, with 215 pedestrians crossing Sherborn Street. The dominant direction of flow was westbound.

Figure 14-9 presents the pedestrian volumes at this intersection in the evening peak hour. As shown, the highest north-south volume (369 pedestrians) was also found to be crossing Commonwealth Avenue between the MBTA tracks in the median and Blandford Street, with the dominant flow also toward the south. The highest east-west volume also occurred adjacent to the Project site, with 798 pedestrians crossing Sherborn Street. The directional flow during the evening peak hour was evenly balanced.

It should be noted that in previous studies, a significant number of cyclists have been observed traveling on sidewalks, particularly along the north side of Commonwealth Avenue. This creates hazardous conditions and occurs despite the University's efforts to encourage proper use of bicycles on its campus.

Boston University Pedestrian Study

In April 1992, the results of an extensive study investigating pedestrian safety in the City of Boston and on the Boston University campus were published.[6] The study, which was commissioned by the University, followed a March 1991 motor vehicle collision that resulted in the deaths of two Boston University student pedestrians. The University formed a task force with the Boston Transportation Department to examine pedestrian safety. The study had numerous findings, including:

- Commonwealth Avenue is one of the roadways with the most injuries in the City of Boston. From 1986-1991, 101 pedestrians were injured along Commonwealth Avenue between Kenmore Square and 1300 Commonwealth Avenue west of the Project site.

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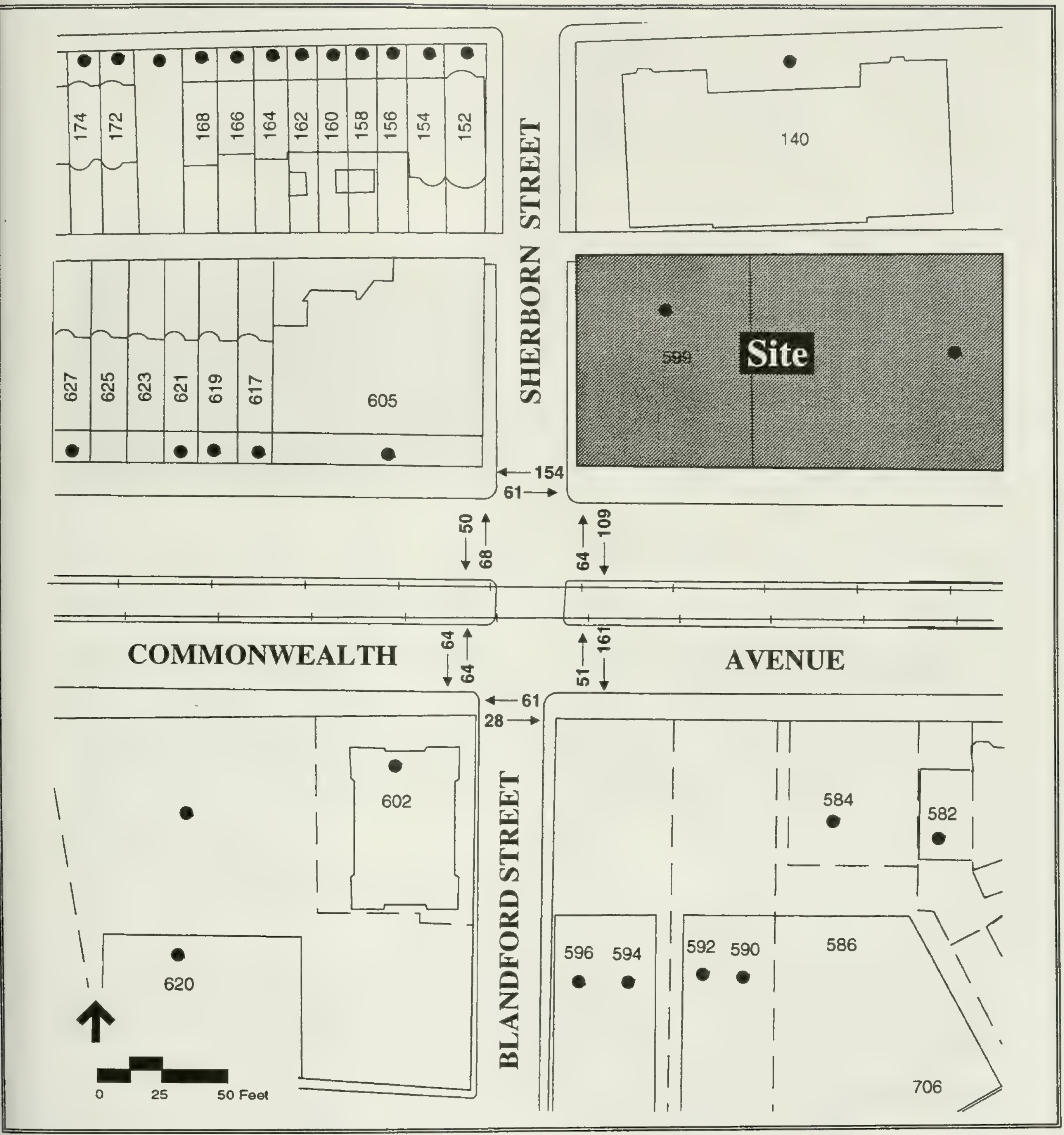
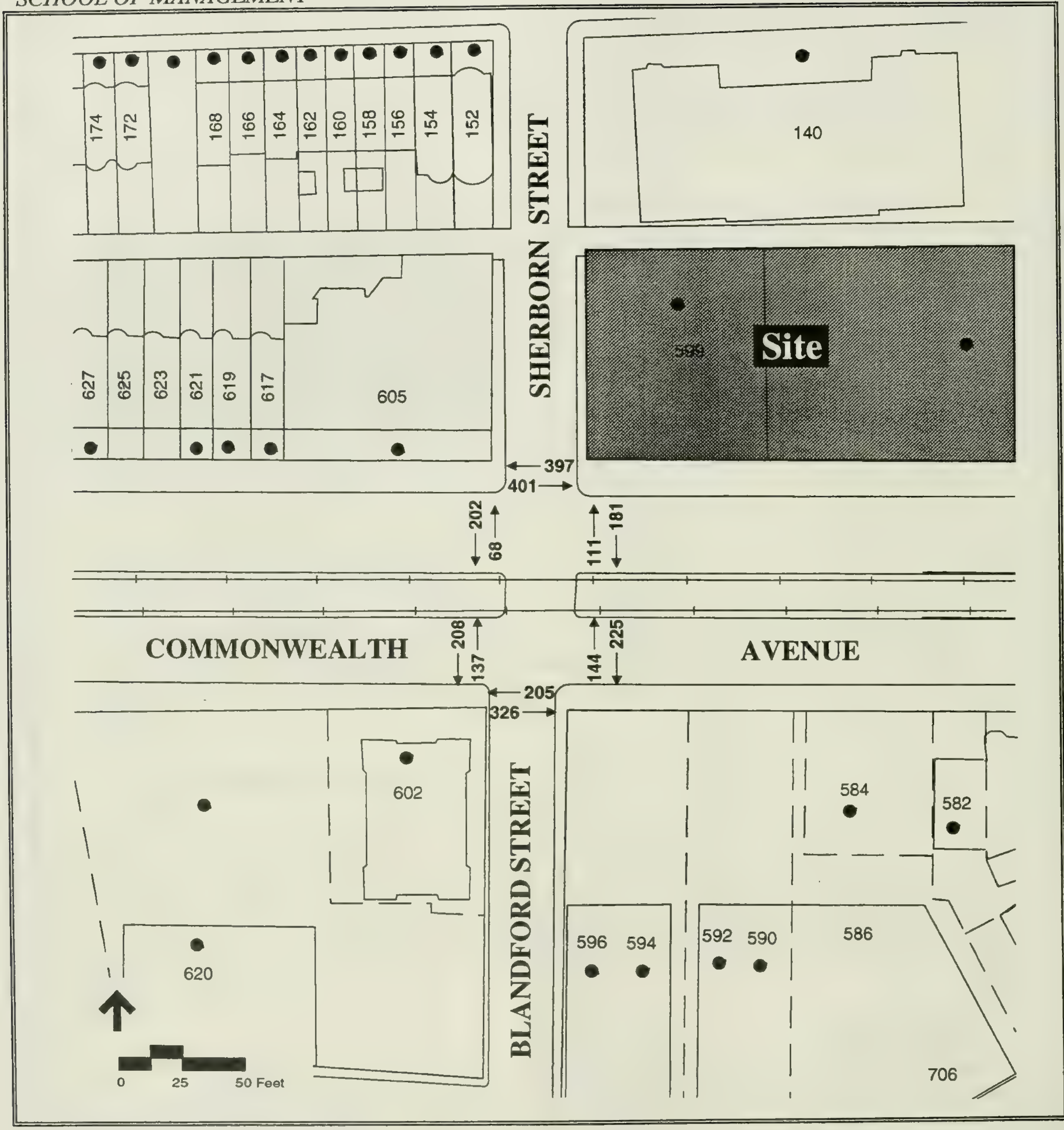
[6] Boston University Pedestrian Study, Final Report, The Center For Survey Research, The University of Massachusetts-Boston, April 1992.



Existing Pedestrian Volumes Morning Peak Hour

Prepared By:
Vanasse Hangen Brustlin, Inc.

Figure 14-8



Existing Pedestrian Volumes Evening Peak Hour

Prepared By:
Vanasse Hangen Brustlin, Inc.

Figure 14-9

- Both driver and pedestrian error contribute to collisions. Pedestrians often fail to cross at crosswalks and often cross against traffic/pedestrian signals. Nearly one-half of the drivers involved in fatal pedestrian collisions in the 1986-1991 period were cited for moving violations, including speeding, driving while intoxicated, and reckless driving.

In data collected by the Boston Transportation Department in 1991, the incidence of crossing outside of a crosswalk (jaywalking) was high (42 percent) and the percentage of pedestrians crossing within crosswalks against traffic (72 percent) was very high. Fully one-third of motorists failed to yield to either jaywalking pedestrians or pedestrians in cross-walks.

Data collected at the University on Commonwealth Avenue, Beacon Street, and Bay State Road yielded similar results in terms of pedestrian behavior. Jaywalking was slightly lower (32 percent) but pedestrians crossing against the signal was roughly the same (71 percent) as in the Boston Transportation Department observations.

During the evening hours when traffic and pedestrian volumes are lower, jaywalking and other illegal pedestrian activity was also higher. Motorist behavior was also more dangerous with fewer than one-fifth of drivers yielding to pedestrians.

Pedestrian safety is a common problem both city-wide and on the University campus. Motorist behavior with regard to pedestrians is also dangerous. The Boston Transportation Department has increased efforts recently to better educate the public to improve driver and pedestrian behavior. Boston University is working closely with the Boston Transportation Department to implement additional improvements on its campus, including signage, increased enforcement, and additional education of the University community. This remains an area of critical concern to all parties involved.

14.6 PROBABLE PROJECT IMPACTS

To assess the impacts of the new School of Management project on the transportation system within the study area, separate travel demand projections were made for the anticipated new use (Executive Training) associated with the development, the increase in parking spaces (89), and other growth in employment anticipated to occur at the University in the next five years regardless of the Project. In addition, trips associated with known background developments were incorporated into the analysis, along with anticipated increases in background traffic. Projected trips were then distributed to the various transportation networks--roadway, transit, and pedestrian. Project impacts (Build conditions) were identified by comparison with existing conditions.

Methodology

The approach to forecasting project travel demands for the new School of Management project differs from the method used for more traditional development impact studies. This was done because with the exception of the proposed Executive Education Center use, the Project is a replacement facility. This means that the faculty and staff who will travel to the new building are already traveling to either the existing School of Management building on Commonwealth Avenue or other buildings on the Boston University campus. Virtually no increase in enrollment or employment associated with this development is anticipated. The forecasting procedures outlined below were reviewed and accepted by the Boston Transportation Department.

For the City's Project Notification Form (submitted to the Boston Redevelopment Authority) for this development, the transportation analysis identified two methods for estimating the net new daily vehicle traffic associated with the Project. The first was to take the information presented on the daily traffic entering and exiting the parking lots that are currently at the site and to increase that traffic in proportion to the number of net new parking spaces being proposed. The second method was to identify the total person-trip generation associated with the Project and apply factors associated with the known modes of travel of University faculty, staff, and students obtained from prior surveys. In either case, the net result was a nominal increase in trips associated with the building. The analysis concluded that the Project will add a total of 228 daily vehicle trips to the Project site.

Trip Generation

Net New Daily Traffic to the Site

With the construction of this Project, the University will be increasing its parking supply on the site from 181 spaces to 270 spaces, an increase of 89 spaces. With a total of 3,146 spaces on the campus, these added spaces represent less than three percent of the total supply. In addition, because the University closed over 160 spaces in the development study area over the past ten years, the addition of 89 spaces is offset by the previously lost spaces. Information on the location of these spaces was provided in the section, 14.5 Existing Conditions, "1992 Charles River Campus Parking Supply." The same section also noted that spaces have been added to the overall campus parking supply in various locations. However, these additions are either outside the parking study area for the Project and, therefore, are at some distance from the development site, or they are associated with commercial lots such as 10 Deerfield Street and not used by University staff. Therefore, within the parking study area scoped by the BRA/BTD and analyzed for this Project, there has been a net loss of over 160 spaces (since 1983) which will be partially offset by the addition of the 89 new spaces on the Project site.

It is anticipated that the usage patterns of these 89 spaces will be very similar to the existing spaces, with only two exceptions. First, educational seminar attendees who park will be new to the campus. Second, on days when Red Sox games are held, it is anticipated that the number of spaces made available for Red Sox parking in the new garage will be limited to the number of spaces available now. The 89 new spaces are not expected to be used for Red Sox parking since building activities are likely to require the use of these spaces.

To provide a conservative estimate of the Project's future trip generating characteristics, the existing vehicle trips to and from the site were increased by 49 percent on non-Red Sox game days to reflect the increase from 181 spaces to 270 spaces. As a result, the existing 464 daily trips on non-Red Sox game days will grow to 692 future trips, an increase of 228 daily vehicle trips.

Similarly, on Red Sox game days, when the same number of spaces will be used for Red Sox parking as today (181), it is estimated that the Project will generate 1,024 trips, again an increase of 228 trips over the 796 daily vehicle trips that are estimated to now occur on Red Sox game days.

Using this method, it is estimated that the new School of Management project will add a total of 228 vehicle trips (114 entering and 114 exiting) to the roadway network at this location on a daily basis. Most of these trips already occur on the campus roadway network. On non-Red Sox game days, most of these new trips will be relocated from other University-controlled facilities where employees who will be transferred to the new building currently park.

Net New Peak Hour Traffic to the Site

As described in the preceding section, the provision of 89 net new parking spaces was calculated to result in an increase of 228 daily vehicle trips to the site. For analysis purposes, it was assumed that one-half of the daily entering trips will occur during the morning peak hour and one-half of the daily exiting trips will occur in the evening peak hour. This is summarized in Table 14-6 along with daily traffic volumes, and shows that a total of 57 additional vehicles are expected to enter and exit the site in the morning and evening peak hours, respectively.

It should be noted that the increases described above were computed as a function of the 89 net new parking spaces only, not the proposed building program. The following discussion on total traffic generation provides an assessment of all traffic generated by the new building.

Table 14-6
Net New Traffic Generation

Time Period	Entering	Exiting	Total
Daily	114	114	228
Morning Peak Hour	57	0	57
Evening Peak Hour	0	57	57

Source: Vanasse Hangen Brustlin, Inc.

Total School of Management Trip Generation

Because the School of Management and other academic offices proposed for the building are currently located elsewhere on the campus, the Project is anticipated to generate only a negligible amount of new traffic for the University as a whole. Nevertheless, it is useful to estimate the total number of person trips that will be generated by uses within the building. To understand the Project's impacts (separate from the analysis of parking above), the following analysis was completed.

Total trip generation for the Project (existing plus new trips) includes an estimate of all person trips to and from the Project on a daily basis. According to University estimates, on a typical active day such as a Wednesday, when the most classes are scheduled and when an Executive Training Seminar is underway, a variety of groups will travel to and from the building. This is shown in Table 14-7.

As shown, it is estimated that, with the completion of the Project, 4,560 person trips will occur at the site over the course of a typical active weekday. Using information on the travel patterns of students, faculty, and staff obtained from the 1986 Boston University Campus Parking Study[7] and estimates for Executive Training Seminar attendees,[8] it is estimated that uses in the building, when complete, will generate a total of 2,125 daily vehicle trips. Of these, only about 80 trips will actually be net new trips to the campus and will primarily be associated with the Executive Training Seminar space.[9] This is because the majority of users of the Project are already using other facilities on the campus and will simply be relocated from elsewhere on the campus to this Project site. Appendix D, Transportation, includes information as to how the trip generation estimates were prepared.

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[7] Boston University Campus Parking Study, Vanasse Hangen Brustlin, Inc., 1986. This study showed that 23 percent of undergraduates, 73 percent of graduate students, 66 percent of staff and 77 percent of faculty drive to the campus and park their vehicles.

[8] Estimates by Vanasse, Hangen, Brustlin, Inc. assumed that 50 percent of attendees will drive and park with one person per vehicle and the rest will walk or take public transportation.

[9] This figure should not be confused with the previously-presented calculation of 228 net new vehicle trips generated to/from the project site, based on the availability of parking. The 80 trips are estimated to be net new to the campus and result from an alternate method of forecasting traffic generation. The more conservative 228-trip figure has been used to assess traffic impacts.

Table 14-7
Total Person-Trip Generation (Existing and New)

Category	Total Person Trips/Day (Two- Way)
Undergraduate Students	2,200
Graduate Students	900
Administrative Employees and Visitors	700
Academic Employees and Visitors	400
Faculty and PhD Students	200
Executive Training (80 participants)	160
TOTAL	**4,560**

Source: Boston University and Vanasse Hangen Brustlin, Inc.

On occasion, the Executive Training Seminar space will be used to its capacity (240 participants). At the rate of 0.5 vehicle trip entering and 0.5 vehicle trip exiting per participant (assuming 50 percent drive and each person makes one entering and one exiting trip per day), a total of 240 vehicle trips will occur, requiring approximately 120 parking spaces. These full-attendance conferences are anticipated to occur only a few days per year and will be treated in a manner similar to other special events on the campus. Special arrangements will be made to accommodate all parkers in this Project's garage and in several other facilities. In addition, the Board of Trustees holds full meetings (75 people) three times per year. Approximately 125 additional vehicle trips are estimated to occur when these meetings are held (assuming 50 non-resident trustees all drive (100 vehicle trips) and half of the other attendees drive to the building from other parts of the campus (25 vehicle trips)).

Future Traffic Conditions

Background Traffic

As described in the methodology section of this chapter, the technique used to determine future traffic volumes differs from the more traditional approach used in other transportation impact studies. With the Project expected to generate only 228 net new vehicle trips per day and 57 net new vehicle trips in each of the peak hours, an evaluation of future traffic conditions would not reflect any real difference over existing conditions.

Development of the future traffic networks involved identifying land use changes expected to be completed by 1997 as well as other factors influencing the transportation system in the study area. These are:

- In order to reflect increased travel demands generated by development projects outside the study area, an annual growth rate of 0.5 percent was applied to the through traffic movements along Commonwealth Avenue, the B.U. Bridge, and Beacon Street, among other streets. Recent Metropolitan Area Planning Council (MAPC) employment projections for Boston were examined to estimate an annual growth rate. The data revealed that a small annual increase in employment is expected in the Boston area beyond 1991. Based on the data available, existing traffic movements at each analysis location were increased by 0.5 percent per year to reflect background growth from developments outside the study area.

- The 899-925 Commonwealth Avenue development, proposed by Boston University in 1987, is expected to add some traffic to the eastern side of the campus. This Project was expected to be completed in two phases, with the first phase completed in 1991 and the second phase completed in 2001. Although the Project has been delayed, for the purposes of this analysis, it is assumed that the first phase will be complete prior to 1997 and the second phase will be completed beyond the 1997 time frame for this study.

- The Olmsted Plaza development, located in the former Sears distribution center on Park Drive, will also impact the study area. Although this Project is delayed, the full development of this Project was assumed to occur prior to 1997 and is therefore included in the future analysis.

- It is anticipated that overall employment at the University's Charles River campus will continue to grow at a rate similar to the past decade. In that time, University employment increased approximately 0.9 percent per year, from 4,609 employees in 1982 to 5,071 employees in 1992. Applying a similar growth rate to 1997 yields an employee population of 5,296, an increase of 225 employees. Applying factors such as the location of employment, percent traveling by automobile, and peak arrival factors, this translates to a total of 66 net new vehicle trips that would occur in either or both of the study area intersections. These trips were distributed to one of three parking facilities excluding the site (the Bay State Road lot, the 700 Commonwealth Avenue garage, and the Bridge lot located on University Road).

Trip Distribution and Assignment

The distribution and assignment of vehicle trips to the study area roadway network is a function of the available parking supply, travel patterns, and travel distances to and from a particular site. To assess impacts on study area roadways, vehicle trips generated by the proposed background developments in the study area and vehicle trips generated by the new School of Management were distributed to the roadway system. This distribution was based primarily on journey-to-work data from surveys conducted at Boston University in 1985 and 1988. The patterns for distributing trips to the regional highway system are given in Table 14-8. Assignments to specific roadways are based on the location of the site, local roadway circulation, and connections to the regional highway system.

Figures 14-10 and 14-11 present the 1997 morning and evening peak-hour traffic volumes, respectively. These volumes were used to complete the future intersection LOS analysis.

Table 14-8
Vehicle Trip Distribution

Route and Direction	Percent
Massachusetts Turnpike	22
Boston University Bridge	22
Route I-93 North	14
Route I-93 South	19
Route 1 North	7
Local Routes	16
TOTAL	**100**

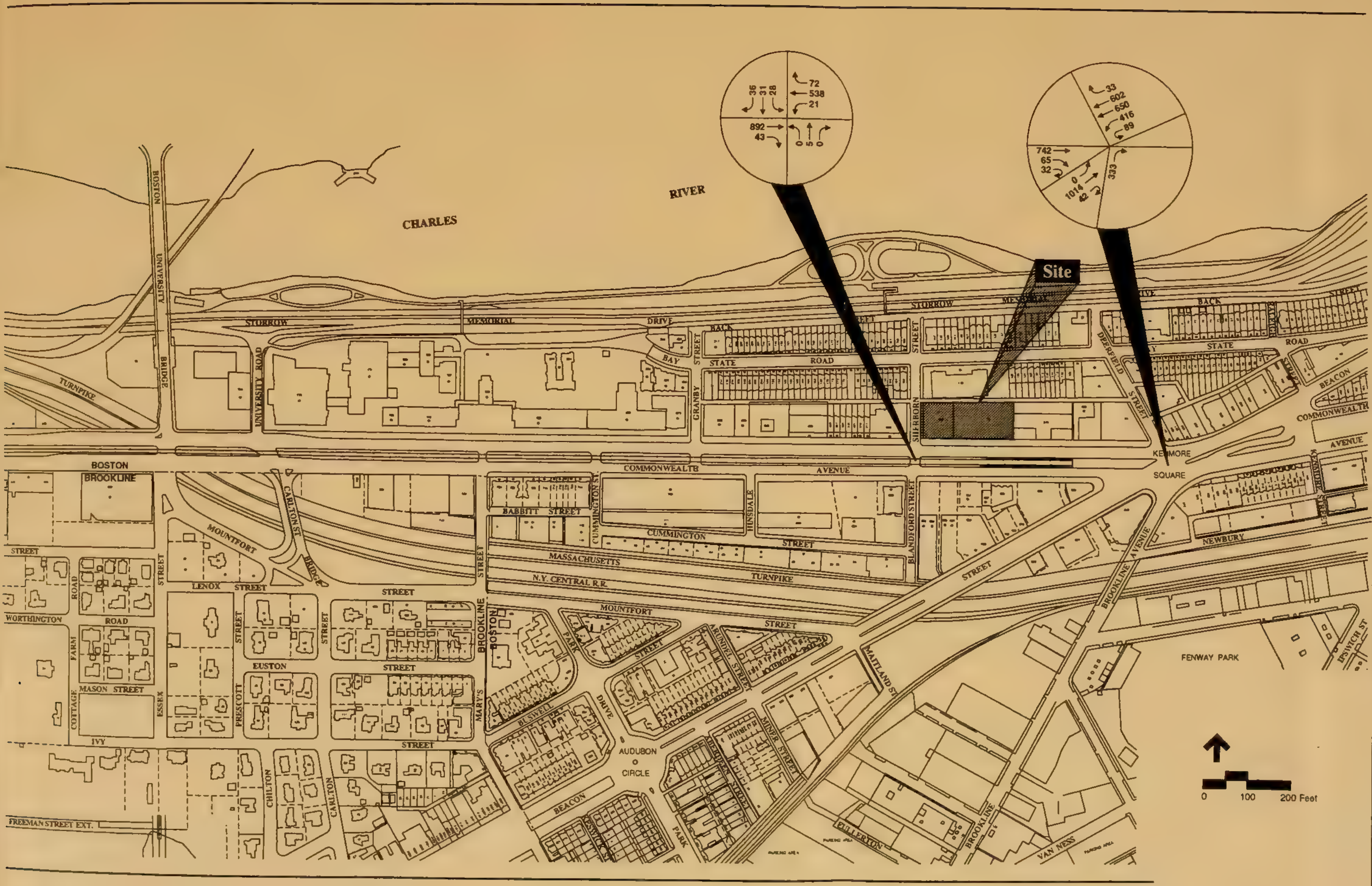
Source: Boston University Employee Surveys

Intersection Level-of-Service Analysis Results

Analysis procedures for determining future intersection Levels-of-Service are based on the HCM; as described in the Existing Conditions section of this chapter. As explained previously, intersection Levels-of-service A through D are considered acceptable in urban areas, while LOS E and F are considered deficient. Table 14-9 provides a summary of signalized intersection analysis results for Existing and 1997 Future No-Build and Build conditions. As shown, at the intersection of Commonwealth Avenue with Blandford and Sherborn Streets, the LOS remains unchanged between existing and future conditions. At the intersection of Commonwealth Avenue with Beacon Street and Brookline Avenue (Kenmore Square), the LOS declines from D in the morning peak hour to E under No-Build conditions and remains unchanged from No-Build to Build conditions. During the evening peak hour, the LOS remains unchanged in the evening peak hour from existing to future conditions, both No-Build and Build (LOS C).

The decline in LOS in Kenmore Square in the morning peak hour in the future condition is the result of increased traffic associated with background traffic growth and other factors not related to the new School of Management project, such as the Olmsted Plaza and 899-925 Commonwealth Avenue developments.

Even though the traffic analyses indicated a change in level of service (LOS) at Kenmore Square from D to E during the AM peak hour between existing and no-build, and part of the assumed no-build background development included the University's Armory project, the change in LOS results from the technicality of jumping from the high end of LOS D into the low end of LOS E. This is an imperceptible change in volume-to-capacity ratio from 0.86 to 0.89.



BOSTON UNIVERSITY

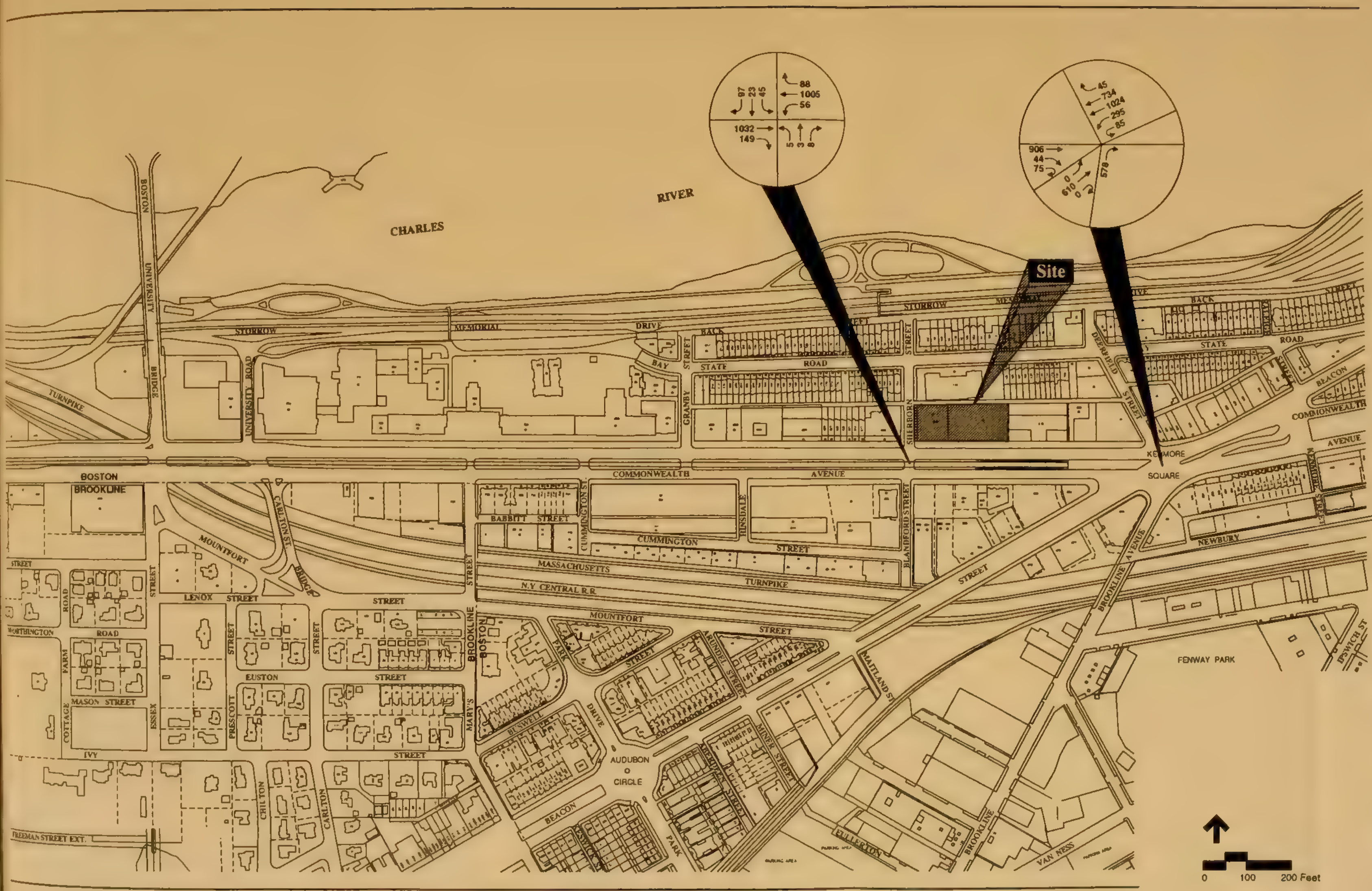
SCHOOL OF MANAGEMENT

1997 AM Peak Hour Build Condition Traffic Volumes

Figure 14-10

Prepared By:
Vanasse Hangen Brustlin, Inc.

August 1993



BOSTON UNIVERSITY

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1997 PM Peak Hour Build Condition Traffic Volumes

Figure 14-11

Prepared By:
Vanasse Hangen Brustlin, Inc.

August 1993

Table 14-9
Existing and Future Level-of-Service - Signalized Intersections

Intersection	Morning Peak Hour V/C*	Morning Peak Hour Delay**	Morning Peak Hour LOS***	Evening Peak Hour V/C	Evening Peak Hour Delay	Evening Peak Hour LOS
Existing Conditions						
Commonwealth Ave. and Sherborn St./Blandford St.	0.48	8	B	0.62	12	B
Commonwealth Ave., Beacon St., and Brookline Ave.	0.86	36	D	0.83	21	C
Future No-Build Conditions (1997)						
Commonwealth Ave. and Sherborn St./Blandford St.	0.49	8	B	0.65	12	B
Commonwealth Ave., Beacon St., and Brookline Ave.	0.89	43	E	0.90	23	C
Future Build Conditions (1997)						
Commonwealth Ave. and Sherborn St./Blandford St.	0.50	9	B	0.66	12	B
Commonwealth Ave., Beacon St., and Brookline Ave.	0.89	43	E	0.90	23	C

* Volume-to-capacity ratio.
** Average stopped delay per vehicle (in seconds).
*** Level-of-Service.

Source: Vanasse Hangen Brustlin, Inc.

Traffic Impacts for Nine Story Building

As noted earlier, two different methods were used to estimate the net new daily vehicle traffic associated with the Project. One was based on the number of new parking spaces to be located on the site. The other started with an estimate of person trips associated with the Project, then applied modal-use factors to identify vehicle trips. The more conservative (higher) estimate resulted from the first approach and was used to analyze traffic impacts within the study area. Even though the analysis was on the conservatively high side, estimated traffic impacts were very small at the two analyses locations selected by the Boston Transportation Department, including

Kenmore Square. The analysis condition was for a ten story building. Even though the Project has now been reduced to nine stories, the estimate of traffic impacts remains the same since it is based on the increase in parking spaces on-site rather than the square footage of the building. Further, the reduction of impacts would remain very small with the nine story building. Therefore, the traffic analysis has not been redone and no change in impacts is suggested for the Project. The original estimate can still be categorized, however, as conservatively high.

Future Parking Conditions

Project Parking Plan

The new School of Management project plan includes the construction of a 270-space three-level, below-grade parking garage on the site. This will increase the on-site parking supply by 89 spaces. The parking within the Project will largely serve the activities within the building. These spaces will be used to accommodate those who now park in nearby facilities such as the 700 Commonwealth Avenue garage, the Bay State Road lot, and other parking areas, plus provide some parking for Executive Education Seminar attendees. Some current parkers on the site are faculty, staff, or students at existing School of Management facilities located nearby. They will continue to park on-site. Other current on-site parkers are affiliated with other University programs. It is likely that there will be a switch of space usage between these parkers and School of Management personnel. In others words, current School of Management people who are now parking in various off-site facilities will shift to on-site spaces, while current site parkers not affiliated with the School of Management will switch to those off-site spaces. As mentioned previously, the net additional spaces are not expected to be used to provide additional parking for Red Sox fans. It is anticipated that the same level of Red Sox-related parking that currently occurs on the site will continue to occur in the future. A plan illustrating the parking configuration within the Project garage is presented in Chapter 2.0, Project Description.

Project Parking Demand

The parking facilities included in the Project will largely serve the activities on-site. The Project is not anticipated to result in any significant increase in parking demand except on days when training seminars are occurring. It is important that the Project parking balance several concerns. It must accommodate activities associated with the Project in a way that does not create undesirable on-street parking problems in adjacent neighborhoods and also promotes the use of public and alternative transportation modes. Since there has been a loss of parking spaces in the area over recent years, there is added pressure to adequately accommodate on-site activities associated with the Project.

The need for the 89 additional spaces is associated with two factors. First, the Project includes one new use, the Executive Education Center, which on-site parking needs to address. Estimates indicate that up to 120 parking spaces would be required on those occasions when the Center is fully utilized. The 89-space increase will help meet part, but not all, of this need. Secondly, according to information on parking demands for this area of the campus, virtually all of the University's existing spaces are in demand throughout the day. This is particularly true of the existing on-site spaces which fill in the morning and remain occupied for most of the day. This is not surprising in light of the loss of 162 parking spaces over recent years. Thus, the space increase can also be viewed as a response to the current tight parking supply situation on the campus.

The 270 parking spaces, then, do not reflect a design for maximum possible demand but reflect a balance of Project demands and is also in keeping with the University's goal to encourage both protection of adjacent neighborhoods and the use of public transportation.

It may be noted that a two-level below-grade parking design was investigated for the Project. This option created several problems. It would have eliminated approximately 100 parking spaces from the Project resulting in the net loss of approximately 81 parking spaces from the existing 181 on-site parking supply. The 170 parking space design would not adequately accommodate Project uses and would further contribute to the overall parking deficit in the area. Furthermore, it would have created serious structural inefficiencies in the building design.

Future Public Transportation Conditions

Once again, because the Project will not result in the addition of new students or faculty, and only a minimal number of employees, only a negligible number of new transit trips to the campus are anticipated. The Project will affect transit services through a change in the primary stop used by a substantial number of students. The existing School of Management is located closest to the B.U. East MBTA station on the Green Line. The Project is served by the Sherborn Street station, one station to the east. Since the B.U. East station is currently more heavily used than the Sherborn Street station, the relocation of a large number of transit riders one stop to the east balances out the use of these two stops and could benefit transit operations by reducing the dwell time at the B.U. East station. Obviously, the dwell time at Sherborn Street will increase.

Based upon the person-trip calculations presented earlier in this chapter, the new School of Management is forecast to generate a total of 750 transit trips per day. Less than 100 of these trips will be new to the Charles River campus (mostly on the Green Line) and, therefore, the impacts on transit operations will be negligible.

Concerning the impact of site-related traffic operation on MBTA services, the proposed garage will have a single entrance, consolidating operations into one location. Motorists will enter a driveway with ample queuing space for vehicles to use access cards or pass an attendant. This is not anticipated to have a negative impact on traffic operations on Commonwealth Avenue. In addition, it is expected that the increase in parking spaces will result in no more than 57 additional vehicles entering the garage during the peak hour, an average of about one car per minute. Since the MBTA operates buses every 9 minutes along this section of Commonwealth Avenue during the peak hour, significant impacts on bus operations are not anticipated.

Future Pedestrian Conditions

As described previously, the Project is expected to generate a total of 4,560 person-trips per day (two-way) with most of these occurring via the street-level entrances to the building. The Project is expected to have a positive benefit on pedestrian travel, however, due to the consolidation of several facilities into one building. Offices for the School of Management are currently located in five separate buildings. Classes are held in three additional buildings. The library for the school is in yet another location. The administrative offices proposed for the upper floors of the development are currently located in seven different buildings. By consolidating these uses into a single location, fewer pedestrian trips into and out of campus buildings are expected. Those trips that do occur are likely to be accommodated on the existing sidewalks and crosswalks adjacent to the building.

Loading

The Project will be served by three loading docks located in the alley behind the site. The configuration of the loading area is illustrated in Chapter 2.0, Project Design. Deliveries to the building will occur throughout the day. Food-related deliveries will likely be coordinated with the adjacent Boston University dormitory building, served by the same alley. Other deliveries will occur in similar fashion to the rest of the campus.

Because the Project largely contains classroom and related academic functions, it requires less supplies and will generate fewer goods than other commercial buildings. Therefore, the loading dock needs to adequately service the Project are less than what might be required for other commercial buildings of a similar size. Furthermore, service and delivery activities for the Project can be coordinated with similar activities campus-wide allowing more flexibility in management of these activities than would typically be afforded other buildings.

14.7 CONSTRUCTION IMPACTS

Project construction is to occur in several stages during a 28-month period beginning in the spring of 1994. The scheduling of the construction period serves to reduce daily truck volumes and construction worker trips. See Chapter 11.0, Construction Impacts, for further discussion on construction activities.

Construction Worker Trip Generation and Parking

A peak daily workforce of between 100 and 120 workers is expected, although the number of workers required during the construction period will vary. Trip generation by construction workers is a direct function of employment levels. It is also likely that a high percentage of workers will use public transportation because, consistent with the Mayor's Executive Order of 1985, it is expected that at least 50 percent of the construction workers will reside in Boston, where use of public transportation is highest. To further encourage use of public transportation, the University will subsidize MBTA passes for construction workers for the duration of Project construction. This will help mitigate potential traffic and parking impacts during construction.

Assuming that 66 percent of the construction workers commute by automobile (the same rate of automobile use as University employees), at the peak workforce level, construction workers will generate 132 vehicle trips between 6:30 and 7:00 AM and again between 4:00 and 4:30 PM.

Parking for construction workers will be available in the commercial lots in the vicinity of the site. Due to the timing and relatively small number of vehicle trips and the variety of parking locations expected to be used, no significant impact to the area roadway system is anticipated.

Construction Vehicle Routings and Deliveries

Specific truck routes will be developed with the Boston Transportation Department through a Construction Management Plan for this Project. Generally, the construction managers work with the Boston Transportation Department to select routes to minimize impacts on local streets and make maximum use of available regional highways. The exact source locations of construction materials is not known at this time, but it is expected that all deliveries will access the site via Commonwealth Avenue and Sherborn Street. Police detail for traffic and safety management will be provided as needed. As with the 899-925 Commonwealth Avenue development, construction vehicles will be discouraged from using neighborhood streets to access or egress the Project site.

Construction Staging

Any use of public street or sidewalk space for construction staging requires a street occupancy permit. It is generally required that developers exhaust all on-site staging opportunities before a street occupancy permit is granted. It is also generally required that adequate provisions for safe pedestrian movement be provided. This is particularly important in areas where high pedestrian volumes are present.

Construction staging for the Project will be located on-site and also at 620 Commonwealth Avenue, a previous construction staging area. It is anticipated that the construction office and some materials be located at 620 Commonwealth Avenue.

Construction of the Project will require a street occupancy permit which includes on-street parking spaces adjacent to the site. The pedestrian fencing and walkway will not encroach onto the travel lanes along Commonwealth Avenue or Sherborn Street and should not impede traffic flow.

Conclusion

Project construction activities will require careful monitoring and mitigation to maintain traffic and pedestrian flows adjacent to the site. With appropriate mitigation measures, the construction impacts on the area's transportation system can be kept to a minimum.

14.8 TRANSPORTATION MITIGATION PLAN

The new School of Management development is forecast to have a negligible impact on the transportation system on Commonwealth Avenue. This is a direct result of the fact that the development is a consolidation of existing facilities into one building. This consolidation will not result in the addition of students or faculty and will add only a small number of new employees. Those who will travel to the Project site in the future are already traveling to the University campus.

Despite the lack of significant impacts, the University has prepared a package of mitigation strategies that is responsive to the City of Boston Transportation Access Plan requirements. The strategies described in this section reflect the proponent's understanding that most of the specific strategies outlined herein will be included in a Transportation Access Plan Agreement (TAPA) between the proponent and the City of Boston. Many of the strategies identified herein are the same types of general demand-management strategies identified in the TAPA.

Each strategy has been classified into one of the following categories:

- Travel demand management
- Vehicle access and circulation
- Public transportation
- Pedestrian access and circulation
- Transportation Coordination
- Construction traffic management
- Monitoring program

The following sections briefly describe each of the mitigation measures and the probable responsibility and timing of their implementation.

Travel Demand Management

Reducing the amount of traffic generated by the University in general is a key element of the mitigation strategy. Boston University has developed an extensive series of travel demand reduction strategies which, although not development-related, address these conditions. When integrated into a comprehensive transportation management strategy, travel demand management can reduce automobile usage and potentially lessen the need for physical improvements to roadways.

The following measures are designed to reduce the number of vehicle trips to the area during peak commuting hours and on a daily basis.

Ridesharing

Ridesharing, where commuters participate in carpools and vanpools, decreases the number of vehicles using area roadways, thereby reducing congestion, air pollution, and fuel consumption. The University will continue to support the following two ridesharing incentives:

- Computerized Rideshare Program - The Commonwealth of Massachusetts, through the funding of a private, non-profit corporation (CARAVAN for Commuters, Inc.), has developed a computerized transportation ride-matching network called RideSource. RideSource matches commuters to carpools, vanpools, and public transportation options through an extensive data base. This computerized tool greatly assists in the formation of new carpools and vanpools by making data available to employees about the residence location and travel times of other commuters who might share a ride. The University's data base on employees and students can be used in the same manner that the RideSource data base is used. Because the University is a large, independent institution with an existing data base, a computerized ridesharing program can be developed exclusively for University employees and students. While this program would be independent of the RideSource network, Caravan could provide advice and consultation on the University's program development.

- Publicity Campaign - In addition to organizing a computerized matching program, the University will continue to make promotional materials on ridesharing available to all employees and commuting students.

Public Transportation Promotion

An effective way to reduce vehicular traffic is to strongly encourage employees and students to use public transportation as a means of traveling to work. The campus is well served by public transportation, including the MBTA Green Line, two MBTA bus lines, and the University's own shuttle bus service. The University will continue to encourage and promote transit usage by continually updating transit service schedule information, assisting commuters with route planning, and publicizing current transit system news.

Bicycle Transportation

The University recognizes the positive traffic reduction benefits from encouraging the use of bicycle transportation for traveling to the site. As part of the University environment, many students currently use bicycles to travel to and from classes. To further encourage this, the University supports the offering of special courses for the University community to encourage greater bicycle usage and to teach safe riding techniques.

The University will also provide secure and convenient bicycle storage racks on the site within the new School of Management project.

Variable Work Hours

Currently, the University encourages variable work hours for its employees. Because of various class times and extracurricular events, faculty and staff work schedules vary from day to day. The University will continue to support flexible work hours of faculty and staff in an effort to reduce peak-hour travel demands.

Transit Passes

The University currently sells MBTA transit passes at the ticket office on the second floor of the George Sherman Student Union. Passes are sold to University employees, students, and the community on the last five working days of each month between 9:00 AM and 5:00 PM. Expanded hours of operation will enhance the convenience of purchasing transit passes at this location. The University will also sell MBTA passes at the Project site to serve those students and employees who live or work in the east Campus area.

Vehicle Access and Circulation

Traffic Signal Operations

The traffic signals along Commonwealth Avenue are part of the computerized system operated by the Boston Transportation Department. The success of this system in improving traffic operations is evidenced in the better level of service observed in Kenmore Square than was noted in previous studies, including the 899-925 Commonwealth Avenue Final EIR/PIR. This is a direct result of changes to the timing and phasing of the traffic signals. As traffic volumes change in the future, it is recommended that the Boston Transportation Department modify the timing of the signals along Commonwealth Avenue to respond to these changes. The University will assist the

Boston Transportation Department by reporting any specific traffic congestion problems that occur in order that adjustments can be made.

Driveway Consolidation

The construction of the Project parking garage will include a single curbcut to serve the site. This will serve to consolidate the existing five curbcuts into one location and will reduce potential traffic conflicts on Commonwealth Avenue.

Enforcement of Existing Traffic and Parking Regulations

The University contributes to the City's efforts to enforce the posted traffic and parking regulations in and around the Boston University campus, which improves traffic flow in the area.

Public Transportation

The public transportation system along Commonwealth Avenue is a critical component of the University's transportation system. As part of its commitment to transit, the University helps maintain the median strip serving the MBTA between Babcock Street and Kenmore Square with daily removal of litter and graffiti along the length of the tracks, snow removal along access ramps, and maintenance of bus stops along Commonwealth Avenue. This maintenance program will continue.

The MBTA continues to study a circumferential transit route to improve public transportation connections to non-downtown locations such as Boston University. In the draft report for that study, the desirability of a transit line from Charlestown to South Boston by way of Cambridge, Boston University, Roxbury, and Dorchester was identified. Although no target date for construction has been set, and no funding has been made available, the University remains fully supportive of a circumferential transit line.

Pedestrian Access and Circulation

The following strategies are intended to enhance the pedestrian environment both adjacent to and on the Project site.

Pedestrian Signage

A key element that ties many of the mitigation plan's physical elements together is a development-related pedestrian signage program. Signage will be used to direct pedestrians to and from public transportation services and to guide pedestrians to major attractions on the campus.

Handicapped Access

The University is committed to providing a circulation pattern for the development site that is barrier free, allowing free movement by individuals with physical disabilities. Elevators, ramps, and indoor handicapped-accessible parking are to be provided in the building program.

Landscape Improvements

The University proposes to add landscaping to improve the aesthetic and visual environment of the development and to provide a more comfortable environment for pedestrians. This is illustrated in Chapter 3.0, Urban Design. Landscaping and street furniture are also designed to promote pedestrian safety and discouraging "jay-walking."

Pedestrian Safety

As described in the Existing Conditions section of this chapter, the University has been working closely with the Boston Transportation Department and the MBTA to improve pedestrian safety on its Charles River Campus. The MBTA and the Boston Transportation Department have agreed to address a problem on the west end of the Boston University campus by closing one of the two existing breaks in the median on Commonwealth Avenue at the intersection with Gaffney and Pleasant Streets. This closure will take place on a temporary basis at first to test the results. If successful, the closure will become permanent. The University is currently working with the MBTA to design and implement additional safety features at the Blandford Street trolley stop such as a barrier and shelter configuration which would discourage jaywalking across Commonwealth Avenue.

Transportation Coordination

Master Plan Update

Boston University and the City of Boston agree that an update of the Transportation Master Plan should be prepared in conjunction with the 1996 Campus Master Plan prior to renewal. However, the new School of Management project, which will involve space-reallocation, will result in minor transportation impacts within the Project's study area and will not inhibit master planning update efforts in the future.

Continuing Cooperative Effort with the City of Boston

Boston University has always worked closely and cooperatively with the City of Boston in trying to promote safe and efficient transportation and parking systems for the campus and for the street system providing access to the University's facilities. Transportation improvements have either been implemented by the University on its own initiative or proposed as mitigation in connection with major development projects such as the Commonwealth Armory. Nevertheless, issues remain to be discussed and resolved, not necessarily as part of the School of Management project, but rather in a more global, campus wide sense. Among these issues are Kenmore Square traffic and circulation, pedestrian/traffic conflicts at the B.U. Bridge/Commonwealth Avenue intersection, and pedestrian safety in general throughout the entire campus. On the latter issue, the DPIR documented efforts made by the University in 1992 to form a task force with the Boston Transportation Department and to collect and interpret information that would be useful in identifying causes and potential solutions to this problem. The University is committed to continue its cooperative effort with the City to seek and implement acceptable solutions to these issues.

Construction Traffic Management

An important element of the transportation mitigation plan is the creation of effective measures designed to safely accommodate vehicular and pedestrian traffic flow during the development's construction phase. The University is committed to working with the Boston Transportation Department to address construction impacts. Summarized below are several measures that the University and the construction contractors will incorporate into the construction mitigation program at the site. The University will make certain that these commitments are enforced.

Construction Traffic Management Plan

The University will develop a construction traffic management plan. It will detail the specific procedures to be followed by the University and the construction contractors during each major construction phase. The University will subsidize construction worker MBTA passes for the duration of the construction period.

Designated Truck Routes

Designated truck routes will be established to govern how trucks reach the site. As discussed earlier, the intent of this mitigation strategy is to restrict trucks to major arteries and prohibit the use of residential streets. The truck routing plan will be designed to protect nearby residential neighborhoods south and east of the site. Enforcement of these restrictions will be the responsibility of the primary contractor and each subcontractor. The roadways in the area that trucks will be allowed to use include Commonwealth Avenue, the Boston University Bridge, Brighton Avenue, and Harvard Avenue. Construction trucks will be discouraged from using Bay State Road.

Covered Pedestrian Walkways

Secure fencing, staging, and bracing will be provided in areas affected by each phase of construction to protect nearby pedestrian and vehicular traffic and to improve safety. The location of gate entrances into each construction area will be determined jointly with the Boston Transportation Department.

On-Site Storage Areas for Construction Materials

The construction contractor will be required to establish lay-down and storage areas to minimize area disruption and confusion. The majority of the construction activity will be confined to the site, although the sidewalk and parking lanes in front of the site will be used during the construction process. The movement of materials will be carefully planned to minimize disruption of adjacent businesses.

Truck Waiting Areas

Truck waiting areas will be designated to avoid creating impacts on nearby residential areas. There appears to be ample room at the site to temporarily store trucks until needed.

Police Officer Traffic Management

Police officer traffic control may be necessary through some phases of construction. The need for police officers will be determined jointly with the Boston Transportation Department and provided as required. Detail officers on assignment in the construction zone will be responsible for maintaining a safe and orderly flow of vehicles and pedestrians, as well as responding to any unanticipated events.

Monitoring

To minimize the amount of automobile use to the site, it is desirable to increase the number of trips by public transportation and to increase the vehicle occupancy rate of those vehicles traveling to the site. These factors serve as a basis for establishing a set of goals for the development. The University is committed to arriving at a reasonable set of demand reduction goals.

The University will monitor development-generated transportation and parking characteristics. This will include the designation of a liaison who will work with the Boston Transportation Department to share information and respond to inquiries.

BOSTON UNIVERSITY SCHOOL OF MANAGEMENT

Final Project Impact Report

TECHNICAL APPENDICES

Submitted To:
Boston Redevelopment Authority

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September 1993

Appendices

Appendix A *Boston University - Economic and Social Impacts*

Appendix B *Solid and Hazardous Waste*

- *Environmental Assessment*
- *Disposal Management Plan*
- *Draft Groundwater Protection Plan*

Appendix C *Infrastructure*

- *Demand Calculations*
- *Correspondence*

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Appendix A Boston University - Economic and Social Impacts

BOSTON
UNIVERSITY

Making A Difference
Economic and Social Impact Source Book
Fiscal Year 1992

Appendix: Boston University Community Programs

Services to Educational Institutions

A. Centers, Institutes, and Partnerships
B. Student Teacher Field Placements
C. Early Childhood and Middle School Programs
D. Secondary School Programs
E. Programs for Teachers and Administrators

Services to Other Non-Profit Institutions

A. Staff Training
B. Professional/Technical Assistance
C. Volunteer Staffing
D. Funding and In-Kind Donations

Services to Individuals and the Community at Large

A. Scholarship Assistance
B. Government and Community Affairs
C. Health Care Services
D. Dental Care Services
E. Athletics/Fitness
F. Adult Education Programs
G. Programs for Professionals
H. Programs for the Elderly
I. Programs for People with Disabilities
J. Mentoring and Counseling
K. Religious Education and Ministry
L. Legal Assistance
M. Charities/Community Action
N. Cultural and Intellectual Programs

Many of the University's volunteer opportunities within the community are coordinated by the Community Service Center, a student directed organization which participates in programs dealing with illiteracy, the homeless, the elderly, and the disabled. Their programs are described throughout this section.

Services to Educational Institutions

A. Centers, Institutes, and Partnerships

Boston University/Chelsea Partnership The University has entered into an unprecedented ten-year agreement to manage the Chelsea public school system. Chelsea schools and the children who attend them suffer from such problems such as a high dropout rate, low SAT scores, and a high teenage pregnancy rate. The University's comprehensive approach to the project involves students, faculty, and staff from many schools within the University, who provide educational, medical and management services. The University is committed to working with the Chelsea community to restructure and rebuild its school system. Since the program's inception, the annual high school dropout rate has decreased 10 points. [1992 direct University support: $732,000]

Boston Higher Education Partnership Formed in 1975, the Partnership contributes expertise and resources to the Boston public schools. Programs have been developed over the years to support and educate children, train teachers and administrators, and provide scholarship funds to make college a reality for thousands of Boston students. Boston University plays a leading role in this cooperative organization of 23 colleges and universities. In 1991-92, Boston University provided approximately 31 percent of all funding contributed by the Partnership, including more than $4.9 million in scholarships, over $1 million in *pro bono* services, and more than $1 million in external grants.

Boston University/Boston Schools Collaborative This Collaborative program provides a variety of services and access to University resources for selected Boston public schools. Services include technical assistance and professional development activities for teachers and school administrators.

School of Education Consortium Council The School of Education directs a consortium of seven local public school systems and eleven public agencies. Education students complete field work in a variety of settings offered by consortium members; the members advise on matters of curriculum reform and performance evaluations. In addition, Boston University has made money available to fund the educational programs of the consortium members. Recent programs include an after-school enrichment program, an artist-in-residence series, and exchange programs between inner-city and suburban schools.

The Urban Initiative In 1985, the Boston University School of Education, in collaboration with faculty of Wheelock College and Simmons College, founded The Urban Initiative to address the problems of urban schools. Projects of The Urban Initiative, which is directed by a Boston University professor, have included the design and development of a child care program which centers on education for children aged 3-6.

The Boston University Science and Mathematics Education Center In 1990, responding to the need for innovation in science and mathematics education, faculty at Boston University established the Boston University Science and Mathematics Education Center. This Center provides incentives for scientists and mathematicians to share their expertise with middle and high school teachers and their students. Faculty who initiate curriculum and educational projects in these areas receive support and encouragement from the Center, and local teachers, in turn, share their insights with University faculty.

The Boston University Center for the Advancement of Ethics and Character promotes the development of research, publications, and outreach programs that help school teachers become more competent and confident in the teaching and study of ethics and character. Faculty in the Center help schools take a legitimate and effective role in the development of ethical understanding in students.

The National Center for America's Founding Documents develops curricula and initiates activities that promote the study of America's Founding Documents. Because these papers embody and explain the philosophical foundations and structure of government in the United States, the Center works to broaden understanding of them as fundamental to a democratic society.

The Schools Reaching Out project seeks to foster academic and social success for children through the promotion of improved parent/school/community relationships. The project primarily targets low-income communities. Initial efforts in the David A. Ellis School in Boston have included the development of an on-site Parent's Center staffed by those involved in parent outreach.

B. Field Placements of Student Teachers

All students pursuing certification programs in the School of Education must complete a field placement in an appropriate school or community agency. The School has been linked with neighboring public schools since 1910, and has placed thousands of Boston University students in classrooms. In 1991-92, more than 900 students assisted teachers and social service agencies in the Boston area and throughout the world. In exchange, the University awards four-credit scholarships to cooperating educators, allowing them to pursue their own continuing education needs at the University. Additional scholarships are given to participating school systems and agencies for their discretionary use. During the past ten years, the University has provided over $1 million in scholarship aid through this program.

C. Early Childhood and Middle School Programs

Dental Health Plans for basic preventive care and dental services have been offered to Boston area public school students since 1985. Today, seventeen schools participate in a program offering their students biannual examinations and care on a prepaid plan at much lower cost than regular dental health plans.

Physical education instruction and supervised play has been provided by students from the School of Education for more than ten years to elementary school students at the Hamilton School in Brighton. A similar program was begun with the Gardner School in Allston in 1987. Buses are provided by the University to transport children to and from the Case Athletic Center for these programs.

The Early Learning Center is a public pre-school developed in 1987 by faculty in the Urban Initiative from Boston University and Wheelock and Simmons Colleges and by Boston school personnel. Serving children between the ages of three and six, the school is open year-round from 8 a.m. to 6 p.m., offering both instruction and day care. It has become a national model for early education programs.

The Educational Clinic, housed in the School of Education, has offered diagnostic assessment and remedial tutoring in reading to hundreds of students from Boston area elementary schools since 1932.

The Center for the Assessment and Design of Learning at the School of Education offers assessment services and educational recommendations to school personnel and parents of those elementary and secondary students who have special needs in reading and writing. It also offers professional development programs to several school systems.

The Bilingual Integration Pilot Program in the Shurtleff School in Chelsea brings together monolingual and bilingual children and teachers in mixed groups, without compromising the principles of bilingualism. All children in the school are integrated for academic and recreational activities, and their biculturalism is encouraged.

Engineering Open Houses are held several times each year by the College of Engineering to acquaint young students with the field of engineering and to encourage them to study engineering by showing the variety of research being conducted at the University. Students who visit these open houses from school systems throughout the Boston area meet undergraduates who may serve as role models.

Partners in Learning is a mentoring program pairing children from the Lewis Middle School in Roxbury with Boston University students who serve as role models. The program was honored by President Bush as a Point of Light in January 1991. The program is designed to work with at-risk youths to assist them in developing life strategies. Since 1988, Partners in Learning has served 100 students.

The Adopt-A-School Program made it possible for the Rho Sigma Chi fraternity at Boston University to adopt the Mary C. Burke Elementary School in Chelsea. In addition to providing physical improvements to the school, fraternity members take children to sporting events, run a Big Brother/Little Brother program, provide tutoring, and sponsor a variety of special events. A wider role for fraternity members is anticipated as they learn more about the school's needs.

The Mathlete's Convention at Boston University is attended annually by approximately seventy local seventh- and eighth-graders. Students compete in problem-solving math games. This convention was started in 1989 as a way to stimulate an early interest in mathematics.

Youth Tutoring is an after-school tutoring program for students between the ages of six and seventeen from the greater Boston area. Approximately fifty members of the Boston University Community Service Center have been offering this tutoring since 1987 and through it have enhanced the reading and math skills of hundreds of children.

Volunteer service in the Williams School involves thirty Boston University students each year who are taking a course entitled "Service in Schools." They work in this Chelsea school as a field component of their study of the values and processes of public service. The volunteers offer tutoring, enrichment opportunities, and help with paper work, and serve as role models for the elementary school children in the classrooms.

MASSPEP The College of Engineering participates in the Massachusetts Pre-Engineering Program, an after school program designed to encourage, motivate, and prepare elementary school students in Boston for careers in engineering, mathematics, and science.

The Meteorology Project in Chelsea has brought television meteorologists Bruce Schwoegler and Jack Borden together with School of Education science educators. They have given a series of lectures and have set up weather stations in every elementary school in Chelsea, as well as a computer terminal for the sixth grade in the Williams School. The group has developed teacher and classroom activities relating to weather and climate.

D. Secondary School Programs

Upward Bound/Project Advance This program provides academic enrichment and remedial help, on an annual basis, to approximately 60 Boston-area high school students through intensive classroom work during the academic year and a six-week residential tutorial program in the summer.

The Reading and Study Clinic The clinic offers individual reading evaluation and remedial help to middle and high school students and adults. Tutoring is offered at the School of Education by graduate students in the reading program. The clinic has served as a model for other such programs and has introduced hundreds of children and adults to a richer reading experience.

Contemporary Mathematics and Technology as a Driving Force for School Reform is an innovative program in the Mathematics Department to introduce high school teachers to revolutionary new ways to teach math. Begun in 1990, the program is currently working with forty to forty-five teachers who use the new curriculum ideas in their classrooms.

On Growth and Form is a program in the Physics Department that provides a series of workshops so that local high school students can learn about probability and fractal geometry by looking at random processes in nature. Through experiments, computer simulations, and computer games, students learn about the similarities of the microscopic and macroscopic worlds. Professors hope to develop a national curriculum based on this project.

Program in Mathematics for Young Scientists (PROMYS) is a six-week summer program for high school students from all over the United States. Students chosen on the basis of merit and potential attend classes emphasizing active problem solving, including the formulation, criticism, and modification of conjectures.

The Advanced Studies Program offers scholarships to up to twenty seniors from Brighton High School and English High School for one course at Boston University. Students who exhibit the potential to benefit from a college-level course are thus able to build their skills and gain credit toward a college degree. More than 135 students have received scholarships since 1984.

The Adopt-a-High School Program has enabled members of the Boston University Black Law Students' Association (BLSA) to help Brighton High School students evaluate their options for college and to prepare college applications. BLSA members plan to enlist other students at Boston University and to expand their efforts to other high schools.

College Preparation Workshops, offered by the Boston University Office of Undergraduate Admissions, help Brighton High School students evaluate colleges and submit applications. Workshops have been held since 1983. The University's Director of Financial Assistance runs an additional workshop for parents applying for financial aid.

Project STEP The String Training and Educational Program for minority students offers musical training to gifted Boston-area students. The program is a collaboration between the School of Music, The Boston Symphony Orchestra, and the Greater Boston Youth Symphony Orchestra.

Summer Training and Education Program for inner-city school students offers both remedial academic help and employment to approximately 50 students each summer. For seven weeks, students receive tutoring each day and hold down clerical or other jobs at the University.

The High School Honors Science and Engineering Program was started in 1978 to offer twenty to thirty highly talented high school juniors from throughout the country the opportunity to come to the University for six weeks in the summer in order to conduct serious scientific and engineering research. The program is funded by a National Science Foundation grant administered by Boston University.

E. Programs for Teachers and Administrators

Boston Leadership Academy offers advanced management training to current and likely future principals and headmasters in the Boston Public Schools. Each year, 35 participants attend weekly sessions, bi-weekly lectures, and day-long workshops to discuss issues of educational leadership. Since 1989,the Academy has provided training to those involved with the Boston Public Schools as part of a School-Based Management/Shared Decision Making program system-wide; training programs have reached more than 200 parents, teachers, and administrators from 32 schools.

The Microcosmos Project has developed a complete curriculum of hands-on science projects dealing with the world of microbes. Science educators visit the Microcosmos Science Education Museum in the School of Education. Since 1987, more than 75 middle and high school science teachers have participated in workshops. Another 500 teachers have attended lectures and joined the Microcosmos network of science educators.

Project Interact is a two-year federally-funded program to teach communication skills to elementary and middle school foreign language teachers. As part of the program, teachers of French and Spanish establish contact between their students and native speakers of these languages abroad or in local bilingual classes.

African Studies Center. The African Studies Center's Outreach Program disseminates information on Africa and African-related issues to the public and professionals, such as elementary and secondary school teachers, journalists, and museum specialists.

The Literacy and Language Institute offers assessment services and educational recommendations to school personnel and parents for elementary and secondary students, provides on-site and school-based educational update conferences and courses in literacy, and provides state-of-the-art information to professionals in the education of the deaf.

The Science Teacher Renewal Program has invited public school science teachers to come to Boston University for either a semester or a year of study with School of Education faculty and graduate students. Since 1985, a number of teachers have taken advantage of this opportunity.

The Institute for School Change is a project under the Higher Education Partnership involving the collaboration of eight colleges. Through a two-year program of training activities and assistance from colleges, the personnel of participating schools have engaged in planning changes in instruction. Since its inception in 1989, staff from 32 Boston Public Schools have been served.

Services to Other Non-Profit Institutions

A. Staff Training

The Fetal Alcohol Education Program at the School of Medicine has been training health care providers since 1974 in the early identification of families at risk for fetal alcohol syndrome. Professionals from the program give more than forty lectures and workshops annually to health centers and hospitals, in addition to offering information by telephone. The Program received more than 300 calls in a recent ten-month period during which it served individuals and agencies in the United States and several foreign countries.

The Alcohol and Drug Institute for Policy, Training, and Research teaches social services professionals about substance abuse and seeks to integrate substance abuse knowledge into mainstream Boston University courses. A year-long post-graduate certificate program has graduated 140 masters and doctoral level clinicians. Thirty professionals who have completed the institute's "Training of Trainers Program" provide substance abuse courses to a range of community agencies including health centers, hospitals, social service agencies, and school personnel.

Dorchester Alcohol and Drug Abuse Prevention Program funded by private foundations and corporations, was begun by the Alcohol and Drug Institute to provide substance abuse prevention training in Dorchester. Since 1989, several hundred Dorchester residents have received training. In December 1992, a multiethnic team of neighborhood residents which had designed and implemented programs addressing neighborhood needs, took over leadership of the project from Boston University, thus achieving one of the project's primary goals.

Project Visit is a support and training program for child care providers in centers and in family day care homes who care for children who may develop learning and behavioral problems. It is administered by Boston City Hospital and Boston University School of Medicine.

The Boston Area Health Education Center under the auspices of the Medical Center, has been working in urban neighborhoods for a decade. The Center develops educational programs that help to support the primary care practitioners who are already there and encourage medical and nursing students to go into primary care practice in the inner city. The Center arranges for medical students to provide services to the twenty-five **Neighborhood**

Health Centers throughout the city, which provide high quality primary health care in neighborhoods where it would not otherwise be available.

The Refugee and Immigrant Training Program, started in 1980 by the School of Social Work, has trained more than 280 Asian, Hispanic, Cape Verdean, and other immigrant paraprofessionals in the basics of human services. Individuals already working in the human service field learn the fundamentals of social work and analyze the delivery of social services in the context of their own cultures.

MIDST Program (Multicultural Issues/Diversity Studies and Training) offers a year-long course in multicultural clinical practice and a semester course in diversity management. It also offers diversity training and consultation to non-profit agencies.

B. Professional/Technical Assistance

PR Planners, a student public relations agency in the College of Communication, has been offering free public relations assistance to non-profit organizations for over a decade. An average of thirty students each year spend six to ten hours a week for one semester working on-site, devising publicity campaigns, developing public relations programs, arranging fund-raising events, and establishing media contacts.

AdLab is a professional advertising laboratory run by the College of Communication. Students in the school have developed and implemented advertising campaigns for more than 200 public service and non-profit agencies since 1975. Clients hire AdLab as they would hire any professional agency, and must have a budget capable of implementing the plan. However, they are charged only for out-of-pocket costs.

The Central Artery Tunnel Project was assisted by the Boston University Office of Public Archeology and the Center for Remote Sensing, who evaluated the archaeological significance of the area to be affected by the project. The study helped avoid possible destruction of significant archaeological artifacts, and actually led to the discovery of a number of items of significance, including a pier extending into the Boston Harbor that had long gone unrecorded.

Center on Work and Family, co-sponsored since 1990 by the School of Social Work and the School of Management, is the first university-based research organization studying work and home life issues. By means of demonstration projects, forums, and conferences, the Center educates policy makers in the public and private sectors on work/life issues.

C. Volunteer Staffing

Students from the Sargent College of Allied Health Professions have been serving the community since 1933. In any given year, seventy-five students work as physical therapists, speech pathologists, nutritionists, or occupational therapists. These unpaid professionals provide their services for forty hours a week, and from three to six months in area hospitals, rehabilitation and veterans associations, public schools, and other treatment centers.

Student Interns from the School of Social Work have been serving the community since the 1920s. Every year, more than 400 students work two or three days a week in non-profit social service agencies in the fields of mental health, child welfare, and services for the elderly or refugees. Students offer direct clinical services or work in community organization, systems management, or program planning.

The **Public Management Internship Program** is an opportunity for Public Management students to apply classroom learning to real-world problems, and to experience a managerial project in a public or not-for-profit organization. Examples of internship sites are: Cambridge Civic Association, La Alianza Hispaña, Environmental Futures, the City of Newton, and the National Trust for Historic Preservation.

Student Interns from the School of Education's Department of Special Education have been working in local schools and agencies for decades. Each year, about 30 students work full-time for one semester with children and adults who have physical or psychological disabilities.

Student Interns from the School of Theology have been serving as assistant ministers, Christian Education Directors, and Youth Ministers in local parishes for decades. Between twenty-five and thirty students serve in these parishes for fifteen to twenty hours a week during their second year at the School.

The Applied Professional Experience (APEX) program in the Goldman School of Graduate Dentistry began in 1989. All students in the school are placed in a community dental office as dental assistants. Students are paid a modest fee by the dental office, for which they work 40 hours a week.

Franciscan Children's Hospital Volunteers from the Community Service Center work at the hospital with infants and children who have multiple handicaps. Opportunities for service include infant care, working in the clinic, or assisting teachers in the hospital's classrooms.

The Veterans' Hospital is visited each week during the academic year by midshipmen in the Naval ROTC who spend a few hours with the long-term residents. The students, many of whom bring gifts of cookies or reading material, often form lasting relationships with the residents.

Army ROTC Scabbard and Blade is a program through which cadets participate annually in community service programs such as visiting the **New England Shelter for Homeless Veterans** and helping to build low-income housing.

Habitat for Humanity, an international non-profit volunteer organization, has enabled many students from Boston University since 1970 to participate in the construction of housing for low income families who would otherwise not be able to afford a house. Boston University students recently did the carpentry, painting, and other work that allowed six low-income homes in Dorchester to be completed.

Youth Camps Volunteers can work in one of the many summer camps throughout the Boston area serving urban children ranging in age from 6 to 14. Daily activities include sports, arts and crafts, tutoring, and field trips. This program is organized through the Community Service Center.

D. Funding and In-Kind Donations

The Boston Youth Campaign - Making Connections, summer youth program, and **Safe Neighborhood Plan** have been supported by the University through a summer sports program that offers 100 youths between the ages of 10 and 13 a program of recreational activities. The program objectives are to help these youths build social, interpersonal, and leadership skills. The Jackson Mann Community School Youth Center (for Allston and Brighton) and the Thomas Gardner School in Allston receive University funding.

Events sponsored by the Office of Government and Community Affairs have included the Roxbury Boys and Girls Club Shoot-Out, the Boston Boy Scouts Council, and Boston YMCA Benefit Basketball.

The Muddy River Project in Brookline received over $20,000 from Boston University in donated laboratory space, equipment, and faculty and graduate student help in assessing the physical, biological, and chemical quality of the river. This is part of a plan by the Town of Brookline to improve the water quality of the river. As a result of this assessment, a $500,000 grant was awarded to Brookline by the Corps of Engineers for the river's clean-up.

Holiday Parties are organized annually by the Office of Government and Community Affairs, as well as students, faculty, and staff of the University at locations such as the Thomas Gardner School in Brighton, the Lynch Recreation Center in Brookline, and youth and senior centers in Chelsea. Similar parties are organized each year by University fraternities and sororities.

Furniture donations from Boston University to non-profit organizations are made each year. Since 1984, furniture in reusable condition has been given to organizations including the Massachusetts Half Way House, the New Perspective School, area churches, recreation centers, and the Boston school and fire departments.

Training, Inc. is a training program for unemployed and underemployed men and women. Boston University works with this organization to train individuals for office jobs.
Boston University personnel managers have attended many job fairs, offering presentations about employment opportunities and workshops in interviewing skills.

Services to Individuals and the Community at Large

A. Scholarship Assistance

The University annually provides hundreds of scholarships to residents of the greater Boston community. In 1992, over 350 scholarships worth more than $4.8 million were awarded to Boston public high school graduates, Boston city employees, Boston public school teachers, Boston parochial school graduates, graduates of Bunker Hill and Roxbury Community Colleges, and families of fire fighters killed in the line of duty. The cumulative value of such scholarships since 1981 has been over $33 million. In addition, the University provides scholarships to residents of Chelsea and Brookline.

B. Community and Government Affairs

The Office of Government and Community Affairs, the primary University administrative group linking the University with the community recognizes that Boston University has an impact on its neighbors, and works to ensure that this impact is positive. The Office maintains frequent contact with area residents and state and local leaders, keeping them informed about development plans, evolving programs, cultural events, lectures, workshops, and seminars offered to the community. Two full-time professional staff members work directly with state and city government officials. The Director of State Relations represents the University's interests before the Legislature, Board of Regents, and executive branches of state government. The Director of City Relations maintains contact with the Mayor's office, the City Council, and city agencies.

Community Affairs A Director of Community Relations and a Community Relations Liaison maintain personal contact and communication between the University and its neighbors, working closely with residents and officials in Boston and Brookline. They respond to inquiries, organize efforts to meet community needs, and work closely with local business associations.

The Ride-Along Program Responding to neighborhood concerns about student parties, the Director of Community Relations "rides along" with the Boston Police on designated weekends. Students are encouraged to register events with the University, are given guidelines for the conduct of parties and, if necessary, are disciplined for unacceptable behavior.

Community Task Force Since 1984, the University and local representatives have used the Boston University Community Task Force as a forum to discuss community issues. University administrators, planners, and consultants also meet regularly with representatives of neighboring community organizations.

Master Plan Boston University, in cooperation with Community Task Force representatives and city agencies, was the first institution in the area to develop a Master Plan approved by the Boston Redevelopment Authority. The 10-year plan for the Charles River Campus analyzes both the University's needs (housing, enrollment, parking, academic and recreation) and potential sites for development.

Project Advisory Committee As an extension of the master planning process, the City and University organized a Project Advisory Committee to review a Planned Development Area Master Plan for the Commonwealth Armory site. Representatives from neighboring communities serve on this committee.

University Associates Cooperation Agreement is a comprehensive agreement which was negotiated and signed in 1991 by the administration of the Boston University Medical Center and members of its surrounding community. The document provides for a number of activities including employment training and education opportunities, a contribution to neighborhood green space, child care, and the creation of a not-for-profit inter-institutional transportation management association (ITMA). In addition, a Director of Community Services was hired by the Medical Center. This individual is responsible for the design and implementation of a community services program which is representative of the Medical Center's mission and responds to the community's need for improved health care.

C. Health Care Services

The Boston University Medical Center in the South End of Boston includes the School of Medicine, School of Public Health, the Goldman School of Graduate Dentistry, and Boston University Medical Center Hospital. The BUMC Hospital and Boston City Hospital, located directly adjacent to the Medical Center complex, are the principal teaching affiliates of Boston University School of Medicine. This rich concentration of medical educators, researchers, and health care professionals represents a major resource for many Boston communities that receive direct services. They are major deliverers of primary care for residents of the South End, South Boston, Roxbury, and Dorchester. The Boston University Medical Center Hospital provides free care to patients unable to pay. Many projects run by the Medical Center are described below, but there are dozens of other contributions to health care delivery, preventive medicine, and education carried out by individuals at the Center. The Sargent College of Allied Health Professions on the Charles River Campus also offers a wide variety of health care services to the community.

Health Care Affiliates There are twenty-two New England hospital and health-care agencies affiliated with the Boston University School of Medicine. Boston University Medical Center Hospital, Boston City Hospital and the Boston Veterans' Administration Medical Center are the School's principal affiliates in addition to many community hospitals. Students and faculty from the School of Medicine treat thousands of patients in these facilities annually.

Boston City Hospital's clinical staff is comprised almost exclusively of School of Medicine faculty members and physicians in training. This hospital is the only source of medical care for many of Boston's residents, particularly those from inner-city neighborhoods.

The Boston University School of Public Health offers the only evening program for a public health degree in Massachusetts. Many public health research projects conducted at the School contribute directly to the community's well being.

Boston Emergency Medical Center, comprised of Boston University Medical Center Hospital and Boston City Hospital is the busiest of Boston's three Level One trauma centers. The School of Medicine plays a key role in training emergency medical personnel in the treatment of trauma victims.

The Solomon Carter Fuller Mental Health Center, a state facility located at the Medical Center complex, is a mental health center offering screening, inpatient and outpatient care, the Children's Special Unit, the Gero Mental Health Program, the Roxbury Court Clinic, and the Libre Drug Clinic.

The Home Medical Service, sponsored jointly by the School of Medicine and the Boston University Medical Center Hospital, is the oldest continuously operating home medical program in the United States. Home Medical provides an array of health services for Boston elderly, delivering medical care to patients in their own homes. The Service makes approximately 5,000 home visits to 800 elders each year, thus enabling many patients who would otherwise require placement in nursing homes to remain independent. No patient is ever denied service for lack of ability to pay.

Elders Living At Home Program serves low to moderate income elders, age 60 or older, who are homeless or face the loss of their apartments, or who live in a life-threatening situation. The program provides clients with temporary shelter leased from the Boston

Housing Authority while permanent housing is located. ELAHP also provides or arranges for social services, health services, and legal counsel. This program also coordinates nursing and social work staffing and the Cardinal Medeiros Center, a nutrition site that serves some 150 homeless people daily.

The Boston Area Health Care Center provides academic support, mentoring, and paid internships to inner city youth during seven-week summer programs. In 1992, approximately 300 students graduated from this program.

Vaccines and Screenings Through the Boston University Medical Center, free vaccinations and health screenings are provided to the community. These include annual influenza vaccinations and screenings for skin cancer as well as for prostate cancer, glaucoma, and osteoporosis.

The Arthritis Center Center staff is active in a number of community efforts for arthritis patients in the inner city of Boston, including providing professional staff for the weekly Arthritis Clinic at Boston City Hospital, at the Evans Medical Clinic of Boston University Medical Center Hospital, and developing an arthritis outreach program for nursing home residents.

The **Cancer Research Center** sponsors educational programs and its staff carries out patient-care activities at the Boston University Medical Center Hospital, Boston City Hospital, Boston V.A. Medical Center, and other hospitals affiliated with the School of Medicine.

Geriatric Evaluation Center is a consultation program which provides comprehensive interdisciplinary team assessments of individuals 65 years of age or older. The center is dedicated to identifying problems which reduce the independence of older people and to making practical recommendations to enable individuals to function to their fullest capacity.

Silicone Gel Breast Implant Assessment Free evaluations by a plastic surgeon and a breast oncologist are provided to women who have concerns about the medical implications of silicone gel breast implants. Monitoring of implants and coordinating of medical care are also provided as necessary.

The Sargent Clinic at Boston University is a multi-service clinic in audiology, occupational therapy, physical therapy, and speech-language pathology, with vocational rehabilitation services and a fitness center. Speciality programs include: a Foot and Ankle Clinic, Postural Screening services with a state-funded program to train school health personnel in early detection of such disorders as scoliosis and lordosis; WordMoves, a program for preschool children with language/motor problems; plus seminars and workshops.

Biotechnology Education Several educational training programs are offered to the community including a Teacher Training Program, a minority High School Student Research Apprentice Program, a Biomedical Careers Program, and CityLab. Since 1990, 60 high school science teachers have participated in biotechnology training, 20 students and 4 teachers have assisted in the High School Research Apprentice Program, and 28 Boston residents have completed the 28-week training program in Biomedical Careers. Another 75 students and 30 teachers have participated in the CityLab program.

Nurse-Midwifery Education Program was established in response to the decreasing supply of obstetrical providers and the concomitant rise in infant mortality. The goal of the program is to increase the supply and ultimately the retention of community-oriented primary care nurse-midwives.

Massachusetts Elderly Diabetes Education Program (MEDEP) The School of Public Health, in conjunction with the Massachusetts Department of Public Health, the Office of Elder Affairs, the Boston Commission on Affairs of the Elderly, and The Joslin Diabetes Center, conducts a series of health education and training initiatives to increase diabetes-related symptom recognition, help-seeking, and follow-up care among elders. The program targets 750 low-income elders with information, screening programs, and follow-up medical care for complications.

Intervention and Stimulation for Exceptional Children (ISEC) Under the direction of the Department of Psychiatry, the Medical Center operates two programs for multiple-handicapped individuals. One is a day program approved by the Department of Education for children up to the age of 22 who live in Boston; the second is a day program that provides services to adults (age 22 and older) who are referred by the state Department of Mental Retardation.

Join Together The School of Public Health was selected to participate in this national organization for communities fighting substance abuse. As a member, the School will assist community groups to develop and strengthen skills needed to achieve a major reduction in substance abuse.

The Mom's Project is a community-based substance abuse eradication program designed to help drug- or alcohol-addicted African-American and Hispanic women of the inner-city end their dependence and to assist them in reducing their risk of contracting AIDS. Since the program began in 1989, more than 700 women have been helped.

Domestic Violence Education This program, currently under development, will help physicians identify signs of domestic violence and assist the victims.

The Failure to Thrive Clinic at Boston City Hospital has been at work since 1984 to identify and treat children who are not growing at a normal rate due to malnutrition. Most of these problems are due to poverty and resulting family stress.

Severe Pediatric Under-Nutrition Surveillance System monitors all children under the age of six seen in the hospital's emergency room. Once a child is identified as malnourished, the Clinic offers nutritional counseling to the family and works to get them support monies and nutritional supplements. The Clinic operates a clothing- and food-donation program as well. Between seventy and eighty percent of the more than 300 children treated annually are able to build up to normal weight within a year.

Medical Care Services Information is provided by the Boston University Medical Center Hospital to Boston residents on a toll-free telephone number staffed Monday through Friday, 9 a.m. to 5 p.m. General information about hospital services and a quick reference guide to choosing a physician are offered. The phone number is 1-800-842-3648.

Hypertension avoidance training is offered by members of the University's Cardiovascular Institute through programs aimed at preventing and treating heart disease. Sessions offered within the local community include training members of the Boston Police

Department to monitor one another's blood pressure and lessons in exercise and weight control.

Matters of Health is a column on health issues, furnished free of charge to twenty-three eastern Massachusetts daily and weekly newspapers for more than ten years. The column is prepared by the Medical Center's Office of Publication Services with the cooperation of faculty and staff.

The AIDS Support and Advocacy Group, an organization run by the Community Service Center, works with the AIDS Action Committee, the Children's AIDS Program, and Boston City Hospital to provide basic non-medical services for persons with AIDS who are homebound, or for those who serve as AIDS-awareness advocates or educators. Many volunteers work with children with AIDS.

"AIDS Services in the Boston Area Latino Community" is a resource guide prepared by researchers from the Boston University School of Public Health and Latino Health Network members. It was published in 1989 for distribution to social service agencies in the Latino community.

HIV-AIDS and Substance Abuse Education The School of Public Health offers a six-week certificate program in HIV-AIDS and Substance Abuse Education. The program is designed to address the shortage of public health personnel particularly among African-American and Hispanic populations. The School offers both financial and child care assistance to students.

The Massachusetts Chapter of the Committee to Combat Huntington's Disease has its headquarters at the Medical Center. Medical Center faculty and staff regularly raise funds for the Chapter.

The Parkinson's Disease Program, with headquarters at the Medical Center since 1979, runs an information and referral center that responds to over 3,000 telephone inquiries every year.

The **Danielsen Institute** provides discounted, direct mental health therapy services to individuals, couples, groups, families, and special focus groups in the Greater Boston area.

The Resource and Referral Center for Alzheimer's Diseases and Related Disorders, located at the Medical Center, provides information about the disease and and how to obtain help and treatment. The Center answers more than 1,200 requests for information annually. Physicians at the Center are engaged in research on new medications to treat Alzheimer's and related diseases.

D. Dental Care Services

The Goldman School of Graduate Dentistry was founded in 1963. Consistent with its philosophy of community outreach and "clinical training with the highest regard for human services," the School has instituted programs to serve many who often go without dental care. The School works in close cooperation with the Home Medical Service, the Boston University Medical Center Hospital, and the Neighborhood Health Centers to provide preventive intervention and referral services to underserved populations.

The Applied Professional Experience (APEX) program in the Goldman School began in 1989. All students in the school are placed in a community dental office as dental assistants. Students are paid a modest fee by the dental office, for which they work 40 hours a week.

Free dental screenings have been offered by the Dental School since 1981. On selected Open House Days, new patients can receive an initial dental exam, X-rays, and oral health screening. More than 300 Boston residents took advantage of this program last year.

Geriatric Dental Health Programs are provided to more than 900 elders annually by doctors from the Goldman School through the Home Medical Service and through visitations to four nursing homes, the Spaulding Rehabilitation Hospital and the Jewish Memorial Hospital.

Dental Health Plans for basic preventive care and dental services have been offered to Boston area public school students since 1985. Today, seventeen schools participate in a program offering their students biannual examinations and care on a prepaid plan at much lower cost than regular dental health plans.

A **Special Needs Dental Program**, run by the Dental School, sends doctors and students to more than 600 sites throughout Massachusetts to provide basic dental care to children and adults with disabilities. More than 5,800 patients are seen yearly in early intervention programs, Chapter 766 school programs, adult day programs and workshops, and community residential programs.

Day Care Centers in Boston, including two StrideRite centers and the South End Day Care Program and shelters for battered women, bring children between the ages of two and five to the dental school for treatment. Nearly 100 children are seen weekly, and patients are given a 50-percent discount.

Mass Migrant, a social agency for poor children in Lawrence, New Bedford, and Fall River, brings groups of children to the dental school for treatment, cleaning, and basic care. This program has brought free dental care to between seventy-five and one hundred children annually since 1980.

Dental Health Centers Through the School of Graduate Dentistry, Boston University provides quality dental care in state-of-the-art clinics at reasonable rates to all residents of Greater Boston.

E. Athletics/Fitness

Intercollegiate Athletics Varsity events are open to the public and tickets are regularly donated to underprivileged children and to civic groups such as YMCAs and community centers.

Athletic and Recreational Facilities are available for local high school use and for Special Olympics programs. Students from the School of Education sponsor weekly programs at the Case Physical Education Center for more than 350 elementary and junior high school students. Free ice time is provided for youth hockey programs, and the indoor track at the Commonwealth Armory is made available to public schools. In 1992, the University provided over $154,000 in donated use of its athletic and recreational facilities.

Special Olympics The University hosts the Massachusetts Special Olympics and the Suffolk Special Olympics each year. Faculty, staff, and students volunteer their time to support programs in which disabled people participate in weekly sports training and annual competitions.

Sargent Camp, a year-round recreational facility in New Hampshire, serves a wide constituency under a guiding ethic that aims to foster stewardship for the environment and a sense of teamwork. Each year, more than 3,000 school children participate in environmental education programs. In addition, numerous corporations, colleges and universities participate in adventure-based team-building programs. The camp is also a meals site for the Senior Nutrition Program three days a week.

F. Adult Education Programs

Prison Education Program. This program provides credit courses and degrees to inmates at the MCI-Norfolk prison facility. The University subsidizes tuition and faculty salaries. Since 1977, more than 100 bachelors' and 20 master's degrees have been granted. The recidivism rate for graduates of this program is extremely low.

The Intergenerational Literacy Project in Chelsea encourages language and literacy development in families who speak languages other than English. Both children and parents attend classes that place emphasis on valuing their cultural heritage while teaching them reading, writing, and speaking skills in English. The program, which is part of the Boston University/Chelsea Partnership, began in 1989.

The Literacy Program, one of the many volunteer programs run by the Community Service Center, works with several literacy agencies in the greater Boston area. Boston University students serve as tutors in English as a second language, adult basic education, and help individuals seeking a General Equivalency Diploma.

The Jackson Mann Community School Adult Education Program is run by Champions, a community service group in the College of Communication. Student volunteers work at the school tutoring, adult immigrants who are illiterate in English.

G. Programs for Professionals

The Small Business Development Program has helped over 800 potential entrepreneurs decide whether to start a business and write business proposals. Management professionals also provide support and help in finding financial backing.

The **Center for Energy and Environmental Studies** offers publications designed to deliver information to the community regarding the interrelationships between energy and the environment, emphasizing the significance of scientific research in policy-making.

The **Manufacturing Roundtable** teams faculty investigators with operating executives from a variety of industries, conducts conferences, seminars and symposia, and develops new courses, curricula, and teaching materials to advance manufacturing excellence through applied research.

The **Health Policy Institute** The Institute's Center for Industry and Health Care conducts workshops and conferences for corporate health-care managers, health professionals, health economists and health-institution leaders, and works closely with the corporate sector to promote employee health and productivity and to contain spiraling corporate health-benefit costs.

Workshops and continuing education courses in the health professions are offered regularly by faculty of the Sargent College of Allied Health Professions. An average of 15 programs are held annually, most of which are free or require only a $5 registration fee. Courses of interest to health practitioners cover subjects such as substance abuse, AIDS, and legal issues in research with human subjects. Many workshops report on current research being conducted by members of the Sargent faculty.

H. Programs for the Elderly

Evergreen Program Boston University sponsors this year-round program that, for a nominal fee of $10-$25, provides senior citizens with courses, lectures, and activities covering such subjects as politics, foreign languages, literature and music. A new series of lectures is offered every two months. Between 150 to 250 elders from the Greater Boston area attend each series. In addition, through the Evergreen program senior citizens are permitted to audit all regular University courses, whenever space is available, for a fee of $20.

The Gerontology Center conducts research and promotes education on aging. Courses are offered to practitioners and other interested persons on such subjects as: caregiver stress, healthy aging, drug interactions, and national health insurance. Some academic courses are available under the Evergreen Program.

I. Programs for People with Disabilities

The **N. Neal Pike Institute for the Handicapped**'s attorneys and law students work with professionals in the Aging Project at the Eunice Kennedy Shriver Center in Waltham, serving people who are both elderly and mentally retarded. The Institute also broadcasts a bi-weekly program, Disability Law News and Commentary, on the Massachusetts Radio Reading Network for individuals who are blind.

The **Center for Law and Health Sciences** provides legal consulting services for advocates serving people with mental and physical disabilities, conducts conferences and workshops on assorted health-related issues, and places law students in internships in the community.

Helping Hands is a research and service project affiliated with Boston University that trains Capuchin monkeys to serve as helpers to people who are paralyzed from the neck down. Between eight and ten Boston University undergraduates work for fifteen hours a week for two to four years as animal trainers, teaching monkeys to feed snacks and drinks, load and unload cassettes, and bring items to the person they will help. The monkeys also provide companionship and entertainment.

The Statewide Recreation Network, started in 1981 by the Department of Special Education in the School of Education, promotes creative recreational opportunities that can be enjoyed by people with and without disabilities. The network circulates information about resources and activities in Massachusetts and carries out specific projects to help individuals with disabilities.

Special Education Week has been sponsored annually since 1984 by the Department of Special Education in the School of Education. Workshops, lectures, and special meetings bring current methodologies to the public and professionals free of charge.

The Boston Marathon Wheelchair Division Racers are given assistance with their equipment and with the logistics of the race by students in the School of Education Special Education program and by other volunteers from the University.

J. Mentoring and Counseling

The Partners in Learning program pairs African-American students from the Lewis Middle School in Roxbury with African-American students from Boston University who give a few hours a week to act as their mentors. Fifteen to twenty such pairs have been brought together since 1989. They participate in recreational activities together and often do volunteer work in the Roxbury community.

The Siblings Program, run by the Community Service Center, links students at the University with children in the Winship Elementary School in Brighton The older students provide role models, companionship, and friendship to the younger children. Approximately 40 Boston University students volunteer each year for this program.

Horizons Volunteers work with children at shelters throughout the Boston area. Children range in age from 2 to 14. Volunteers attend an extensive training session to help them understand and serve the special developmental needs of children in shelters. The program is run through the Community Service Center.

The Veterans' Hospital is visited each week during the academic year by midshipmen in the Naval ROTC. Since 1987, students have spent a few hours each week visiting with long-term residents in the hospital. The students, many of whom take gifts as cookies or reading material, often form lasting relationships with the residents.

K. Religious Education and Ministry

The Elderly Ministry Project under the auspices of the Marsh Chapel at Boston University, teaches lay members of the Chapel congregation to minister to elders in local nursing homes. Begun in 1989, the project has trained ten lay ministers to counsel, conduct lay worship, and carry out lay preaching for those who are unable to attend churches.

The African-American Church Project is a cooperative program between members of Marsh Chapel and local African-American clergy. This cooperative group offers worship on campus in the African-American tradition, bringing in local pastors with their congregations and choirs. Members of the Boston University community then visit these congregations as well. The Project also organizes conferences and seminars in African-American worship.

The Howard Thurman Project at MCI-Norfolk and MCI-Framingham began in 1988. The Howard Thurman Center at Boston University donates video equipment, and videos and publications that carry the spiritual message of Howard Thurman, an outstanding preacher and leader in the African-American community. Similar materials are sent to the Hillside Pre-release Center in Roxbury and the McGrath Pre-release Center in Boston.

Weekend retreats at Sargent Camp are run annually by the Howard Thurman Center. Twenty students of differing ethnic backgrounds from West Roxbury High School go through a series of tasks and exercises designed to encourage recognition of their common humanity.

L. Legal Assistance

The Boston University School of Law has been a pioneer in the development of clinical legal education as a complement to the more theoretical perspective gained in the classroom. Each year, approximately 120 students participate in a variety of clinical programs under the close supervision of full-time experienced faculty. Hundreds of Boston area residents are thus offered free legal counsel at a highly professional level.

Criminal Law Clinics, open to third-year law students, have served the Boston area for more than twenty-five years. Students are responsible for the defense in nearly 350 criminal cases each year in the Boston Municipal Court and the Cambridge District Court, representing indigents who would otherwise require a court-appointed attorney. Students in the Prosecution Program represent the Norfolk County District Attorney's Office in cases in the Quincy District Court, prosecuting more than 180 cases annually. All cases are closely supervised by faculty members, who are practicing attorneys.

The Legal Aid Clinical Program enables law students to assist indigent clients in Boston. Through the Greater Boston Legal Services and the Walter E. Fernald State School for the Mentally Retarded, students are assigned cases concerning housing, welfare and social security benefits, consumer protection, divorce and child custody, employment, special education, and other matters.

The Arbitration and Mediation Clinic involves students in the mediation of small claims in a local district court, including conflicts among families, neighbors, landlords and tenants, and consumers and merchants. Some students serve as arbitrators with the American Arbitration Association in cases brought under the "Lemon Law."

The Legislative Services Program involves law students in the drafting of legislation and other projects for legislators, public interest groups, and government entities. Students assist in the formulation and execution of legislative solutions to problems. Approximately forty students have been involved in this program since 1975.

The Aging Project at the Eunice Kennedy Shriver Center Clinic allows faculty members and five students each semester to participate in the evaluation and planning teams for the elderly and mentally retarded individuals at the Shriver Center in Waltham. Students and faculty serve as legal representatives for clients.

M. Charities/Community Action

The Community Service Center is a student directed organization which sponsors more than 450 students who volunteer each year to help in programs dealing with illiteracy, the homeless, the elderly, and the disabled. Many of their programs are described in this section.

The Hunger Action Committee of the Community Service Center addresses local, national, and global hunger through education, fundraising, and direct services. Two major events include the OXFAM Fast and the Boston Hunger Clean-up. During the Fast, more than 1,000 students fast and the dollars saved are donated to OXFAM -- more than $5,000 a year has been raised since 1986. In the Hunger Clean-up, students raise money through business and individual donations while they clean city sidewalks. The Community Service Center raised $1,275 in 1992.

The Student Food Rescue Program, run by the Community Service Center since 1988, provides about 4,000 pounds of food every week to needy Boston residents. Some 40 student volunteers travel to area restaurants, bakeries, and supermarkets to collect food and distribute it to area meal programs including those run by Boston City Hospital, senior citizen homes, and the Boston Family Shelter.

The Mortarboard Society, a national senior honor society, has had twenty to twenty-five members at Boston University since 1975. Each year, members work once a month at the Church of All Nations Sunday's Bread soup kitchen. Members also work with the Boston Partners in Education - STARS program, offering tutoring at local schools and reading to child patients at Boston City Hospital.

United Way In addition to serving on advisory boards and volunteering to many United Way Agencies, the employees of Boston University generously support the United Way of Massachusetts Bay. In the 1992 campaign, faculty and staff contributed more than $168,000 to the United Way.

City-Year Servathon Students, alumni, and staff of the School of Management Public Management Program participated in the 1992 City-Year Servathon, the primary grassroots fundraiser for Boston's urban peace corps. The group raised over $5,000 through pledges of sponsorship for one day of service at the Berkley Street Community Gardens, joining other community volunteers to clean the gardens, prepare walking paths, and winterize the garden. The funds raised will be used to support one City-Year core member's post-service college scholarship.

Recycling Program Run by the Community Service Center, this program organizes and promotes the conservation of natural resources by collecting and recycling office paper and newspaper at established on-campus collection sites. In addition, a task force has been formed to identify ways to incorporate a recycling program in the residences and dining facilities of the University.

The Young at Heart Program Sponsored by the Community Service Center, this program pairs elders with students who assist with errands and provide companionship.

The Boston Can Share drive for donations of canned goods is supported annually by a major drive at Boston University Medical Center Hospital. The donated goods are distributed through the Boston Food Bank to more than 200 food pantries.

An Annual Huntington's Hoop-a-thon, sponsored by the MA/Huntington's Disease Society and the Boston University Medical Center, has been held since 1979 to raise funds for a summer camp for Huntington's patients.

U-Help is an annual fund drive conducted among Boston University Medical Center Hospital employees to provide special funds for patients with emergency needs. Often the funds are used to assist the patient's family with expenses or compensation for lost pay while they stay with a sick relative.

Run-to-Save-a-Child is an annual fundraising road race organized by the Naval ROTC at Boston University. Since 1986, twenty to thirty students have raised in excess of $5,000 each year, which is donated to the Shriner's Burn Clinic.

An "M & M-a-Thon" has run annually since 1986, organized by members of the Sigma Delta Tau sorority. A competition to eat M&M's attracts pledges, and the money raised is donated to the National Committee for the Prevention of Child Abuse.

Air Force ROTC Community Awareness consists of several community service projects in which cadets participate every year. These include the Boston Food Bank, The City-Year Servathon, and Veterans Awareness Week.

Self-Help Groups are given space and support by Marsh Chapel throughout the year. Several twelve-step programs, including Overeaters Anonymous, Al-Anon, and Alcoholics Anonymous hold weekly meetings at the Chapel.

N. Cultural and Intellectual Programs

Boston University is a center of cultural and intellectual activity. On average, there are 250 lectures, performances, and other events each week during the academic year, emanating from the fifteen different schools and colleges of the University. These events include exhibits in the arts, worship services, recreational events, lectures, workshops, conferences, social events, and performances. Most of these events are offered free of charge or for a nominal fee and are open to the public. The following listing illustrates the variety of activities available to the community.

The Boston University Mugar Library Boston University welcomes members of the community to utilize its main research library. With almost 5 million volumes and volume equivalents, and thousands of journals, Mugar Library complements school and community libraries of the cities surrounding the University.

Special Collections contains the University's rare book, archival, and manuscript collections. Among its holdings are the Boston Symphony Orchestra Archive, the History of Nursing Archive, the Abraham Lincoln and Theodore Roosevelt Collections, the Mystery Writers of America Library, the Robert Frost Collection, and the Twentieth Century Archives, a collection of personal papers from more than 1,600 American and European figures prominent in 20th century public life and the arts. The department is open to the public and regularly sponsors exhibits of its collections.

B.U. Bookstore Mall The Charlesbank Bookshop, a component of the Bookstore Mall, holds numerous authors' readings and book-signings throughout the year. Through its Saturday Children's Hour program, which includes storytelling, puppet shows, and craft projects, the world of literature is made accessible to the young and the young-at-heart.

Boston University School of Visual Arts Students and faculty of the the School of Visual Arts are major participants in the community of artists in the Boston area. Members of the faculty contribute their work regularly to area shows, and student work is displayed in end-of-the year exhibits each year at the Boston University Art Gallery. These shows are open to the public free of charge.

Saturday Art Classes have been offered by the School of Visual Arts to Boston area high school students since 1974. Each semester twenty-five talented juniors and seniors are accepted into this intensive drawing class. No tuition is required and admission is based on interest and the submission of a basic portfolio.

Boston University Art Gallery Numerous free exhibitions are held each year and are open to the public. Exhibitions include some of the finest contemporary art and craftsmanship to be displayed in the Boston area. In addition, **The George Sherman Union Gallery** displays the work of many new, local artists.

The School of Music at Boston University is one of the few university-based conservatory quality schools of music in the country. Students and faculty at the school perform in more than 400 musical events throughout the year, all of which are open to the public and are most often free of charge. The Boston University Orchestra has long been hailed by critics, and the Empire Brass Quintet and Muir String Quartet are both Naumburg award winners. ALEA III, a contemporary music ensemble, and two performing collegiums in Early Music and Contemporary Music also perform regularly. The University Chorus produces four major choral concerts each year, and the highly acclaimed Opera Department stages two full productions annually, as well as shorter offerings. Special performances for schools, nursing homes, and other events are frequently arranged throughout the school year.

Lecture Series Each year, the University offers a variety of lectures open to the public, many free of charge. Lectures are given by University faculty and distinguished visitors and cover a wide variety of topics ranging from religion to environmental issues.

The String Training and Educational Program (Project STEP) for minority students is partially sponsored by Boston University, which originally initiated the program with the Boston Symphony Orchestra in 1982. STEP identifies six- and seven-year-olds with talent and interest in music and offers them weekly lessons with master teachers and intensive coaching and encouragement. Between twenty-five and thirty students are enrolled each year in the program, many of them from the FOCUS program that identifies minority first-graders who have musical talent. Several faculty members from the School of Music teach in the STEP and FOCUS programs.

Greater Boston Youth Symphony Orchestra Talented music students, ages 12 to 18, from the communities surrounding the University are invited to participate in this program. In 1992, 240 youths received training and performance experience. The Orchestra has performed at sites across the nation, including Symphony Hall in Boston and the White House.

The Boston University Tanglewood Institute was started in 1965 to give high school students many of the educational and musical opportunities enjoyed by older musicians at the Tanglewood Music Center in Lenox, Massachusetts, the summer home of the Boston Symphony Orchestra. Young musicians study for one to two months under dedicated, professional teachers. Proximity to the Boston Symphony Orchestra makes this a superb opportunity for immersion into the world of professional music by young students.

Boston University School of Theatre Arts The University's nationally recognized School of Theatre Arts stages several public productions each year.

Huntington Theatre Company The University is a major sponsor of this non-profit professional theater company that performs at the University's theatre on Huntington Avenue. Six productions are presented each year to audiences of more than 100,000. The theater also offers several community service programs, including the Student Matinee Series, the Young Critics Institute, and the Huntington Speakers Bureau.

The Humanities Forum at the Huntington Theatre invites noted scholars to write essays for each of the season's productions. More than 7,000 copies of these essays are distributed to audiences and interested readers. The scholars also hold open forums after two Sunday matinee productions of the plays, presenting a brief lecture on each play and opening the session to discussion. The Forum has been running free of charge since 1986, and more than 250 theatre-enthusiasts attend the lectures for each play.

Student Matinee Series are offered by the Huntington Theatre Company enabling 1,200 students to attend each play of the season. Students purchase tickets for $5. Prior to the production the Education Director of the company visits each school and lectures on the background, author, and significance of the play. A new Teachers' Advisory Council of fifteen area high school teachers is working with the Education Director to develop study guides for the discussion of the next series of plays.

Radio Station WBUR 90.0 FM This University-owned and supported radio station broadcasts national and local news, lectures, sports events, classical music, jazz, folk and popular music, arts and entertainment commentaries, and radio dramas to Greater Boston, eastern Massachusetts, and parts of Rhode Island and New Hampshire. The station is qualified by the Corporation for Public Broadcasting and is an affiliate of National Public Radio and American Public Radio. In 1990 WBUR won five Associated Press Awards for news coverage in Massachusetts, more than any other Massachusetts radio station.

Neighborhood Network News Boston University provides studio facilities for the Neighborhood Network News (Boston Cable Access Television) which provides access and service to approximately 200 local organizations and agencies. In addition, the station provides reports on educational systems, politics, and community services to its viewers.

Judson Boardman Coit Memorial Observatory Each week the Astronomy Department opens the University observatory to the public free of charge. Many lectures and presentations are sponsored in conjunction with this program including live telecasts of NASA's historic Voyager 2 flight to Neptune. In 1992, more than 1,800 visitors came to the Observatory.

Appendix B Solid and Hazardous Wastes

This document is based, in part, on the summary of findings included in the main text of the initial environmental assessment report prepared by Haley & Aldrich, entitled "Environmental Assessment, Proposed School of Management Building site, Boston University, Boston, Massachusetts," dated June 1992. This includes the results of environmental laboratory tests performed on soil samples obtained in a test pit program conducted in November 1992. The purpose of this evaluation was to provide information relative to the presence of oil and hazardous materials in the soils and groundwater at the site that have the potential to impact construction.

This evaluation is based on a review and interpretation of readily-available information on historical and current site usage and previous assessments of the property; the results of a limited subsurface exploration program, including instrument screening of soils and groundwater; chemical testing of soil and groundwater from the site; a review of Massachusetts Department of Environmental Protection files and contact with local municipal officials.

SUMMARY OF FINDINGS

A. General

This document summarizes the results of our investigation and provides conclusions based on our review relative to construction of the proposed Boston University School of Management.

B. Historical Site Usage

The subject site area was one of the last portions of the Back Bay to be filled. The site area was filled in approximately 1890. The only identified historical development on-site includes a service station located at the corner of Sherborn and Commonwealth Avenue (601 Commonwealth Avenue), and a two-story brick one family home constructed adjacent to the service station (597-599 Commonwealth Avenue). The remainder of the site has apparently remained undeveloped or was utilized for parking since the area was filled (2,3)[*].

3. Regulatory Status

The portion of the site formerly occupied by the service station (599-601 Commonwealth) is currently listed by the

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[*] Refer to listing of Referenced attached to this document.

Massachusetts Department of environmental Protection (DEP) as a "Location to be Investigated," under preliminary assessment (12). The site is listed due to gasoline and oil contamination of soil and groundwater at the site identified during tank removal and replacement activities, and previous assessments involving subsurface explorations from 1983 to 1987 (13). Remedial measures conducted at the site include soil excavation and removal, as well as recovery system installation for phase separated product identified at the site (13,14,15,16).

D. Subsurface Explorations and Chemical Testing

A subsurface exploration program consisting of seven borings and installation of six groundwater monitoring wells and a piezometer was completed in January 1992. A subsequent exploration program consisting of 17 test pits was conducted in November 1992.

Data collected at groundwater observation wells installed in the boreholes are summarized on Table I. A total of twelve soil samples, collected from the completed borings, were analyzed for contaminant parameters including total petroleum hydrocarbons (TPHs), volatile organic compounds (VOCs), and/or total metals. Four groundwater samples collected form the wells were analyzed for volatile organic compounds at a DEP approved laboratory. Soil and groundwater samples were qualitatively screened using a photoionization detector and gas chromatograph.

A series of 17 test pits were excavated on 7, 8 and 11 November 1992 (see Figure 9-2 for locations). An additional 34 composite soil samples were collected from the test pits. These samples were analyzed for parameters included in soil disposal criteria including VOCs, acid and base neutral extractable compounds (ABNs), priority pollutant metals, pesticides, PCBs, TPH, corrosivity, ignitability, total and reactive cyanide and sulfides. Each composite samples was also screened for total VOCs in the field using a photoionization detector.

Instrument screening data for soils and groundwater is summarized on Table II. Laboratory data for soils and groundwater are summarized on Table III and IV respectively.

E. Subsurface Conditions

The test borings indicated the following sequence of subsurface units in order of increasing depth below ground surface:

- Miscellaneous Fill
- Organic Silt/Peat
- Marine Sands
- Marine Silts and Clays
- Glacial Till
- Bedrock

The deepest boring extended to bedrock at a depth of 171 ft. below ground surface. Depth to groundwater varies from approximately 7 to 12 ft. beneath the site and apparently moves to the north-northeast.

F. Environmental Conditions

Based on the results of the chemical testing program conducted on the samples obtained in the explorations, the subject site can be divided into two areas showing distinctly different evidence of contamination. The first area is the site of the gasoline service station, the other is the easterly portion of the site. The following descriptions will summarize the identified environmental conditions in both portions of the site.

- Former Texaco Service Station Parcel

  This portion of the site is the location of known releases of gasoline, fuel oil and waste oil. Sources included numerous former gasoline underground storage tanks, two possible fuel oil tanks, and underground storage of waste oil. All known underground storage tanks have reportedly been removed from this portion of the parcel (8,11,16). A potential remaining on-site source is the fill material beneath the former service station and to the north. A large quantity of contaminated fill material was reportedly removed form the tank field locations at this site during the tank removal activities in 1987. Reportedly, quantities of visually contaminated soils remained under the former service station, in the northern portion of the parcel and beneath the sidewalk along the southern boundary of the site (11). Petroleum contamination identified in the basement of the abutting property at 140 Bay State Road has been attributed in previous studies to releases form former underground storage facilities at the Texaco Station (11,14,15). Contamination identified in previous studies along the northern and southern boundaries of this site and in the basement of the dormitory at 140 Bay State

Road suggests petroleum contamination has migrated off-site.

The subsurface explorations and chemical testing conducted in this study confirms that the fill material in the northern portion of the former Texaco parcel is contaminated with residual petroleum products. Fill material and the upper portion of the organic soil/peat in the vicinity of the water table (approximately 10 ft.) show elevated levels of VOCs and TPH. Levels of VOCs increase with depth to the water table. Elevated PID screening readings and BTEX (benzene, toluene, ethylbenzene, and xylenes) concentrations have been identified in borings (B6-OW, B7-OW) and test pits (eg. TP-1, TP-3) located in areas beneath the former station or north of the former station where former remedial efforts were not conducted. However, The identified soil contamination does not appear to extend to greater depths below water level. The underlying marine sands shown only low levels of VOCs based on PID screening results. The low permeable peat/organic silts beneath the site apparently reduce the downward migration of contaminants.

Elevated levels of some metals were detected in fill material excavated in the vicinity of a former waste oil tank and downgradient from this location at the water table (TP-4, TP-3). Elevated levels of mercury (8.0, 0.31 ppm) and lead (220, 210 ppm) were detected at these locations.

Soil screening results of the fill material in the southern (Commonwealth Avenue) portion of the former Texaco parcel showed levels generally under 10 ppm. This suggests that much of the original contaminated fill in the vicinity of the former gasoline tanks was effectively removed. However, elevated VOC concentrations were identified at the watertable in test pits conducted at locations TP-5 and TP-6 (Table III). Some residual contamination likely exists at depth in areas of the former remedial soil activities.

Groundwater beneath the former Texaco parcel shows BTEX contamination probably resulting from the former gasoline releases at the site. Phase separated product was not identified, although strong petroleum sheens and odors were documented during the exploration program. In addition to BTEX, 2-butanone

(MEK) was detected in groundwater from boring B7 at 600 parts per billion, ppb. Soil in test boring B6 at the water table also showed elevated levels of MEK (900 ppb). Uses of MEK include use as a solvent, and in rubber cement, inks, paint removers, resins, polystyrene, chlorinated rubber, and cleaning solutions (17). It is also used as a degreasing agent and a lube oil dewaxing agent. Therefore, it may have been utilized on the site in the past although historical use was not identified.

Another solvent identified in groundwater from monitoring well B6-OW was 1,2-dichloroethane at a level of 1.4 ppb. This compounds may also be associated with the observed gasoline contamination. Uses of 1,2-dichloroethane include metal degreasing and as a solvent to remove lead form leaded gasoline (18).

o Parking Area (Easterly portion of site)

VOCs were not detected in soil samples collected from test pits and borings located east of the former service station parcel. PID screening readings were generally very low with the exception of sample B3-S2 (146 ppm). However, recovery of this sample was poor and this anomalous reading may reflect instrument error. This sample was also screened using the GC which indicated non-detectable levels of volatile organic compounds. No obvious or visual evidence of contamination were identified during the test pit program.

Fill samples from B1, B2 and B3, that were tested for TPH indicated low concentrations in the range of 70 to 290 ppm, and a relatively high concentration of lead 2,500 ppm at one sample location (B3-OW). Soil samples collected from test pits located in the eastern area of the site showed TPH concentrations generally below 200 ppm. Elevated levels of lead, typical of fill in urban areas, were detected in samples from the eastern areas of the site (36-780 ppm). Levels of other metals were generally low to non-detected (Table III).

Selected samples were analyzed for additional disposal characterization parameters. Pesticides total and reactive cyanides, and reactive sulfides were not detected in the suite of analyzed samples (Table III). Low levels of the PCB, aroclor 1260

(0.074 ppm) were detected in sample TP-4-S1 collected from the former waste oil tank location. Flash point was determined to be greater than 140°F for the samples analyzed.

Groundwater samples from this portion of the site which were screened using the GC indicated low levels (<3 PPB) of toluene and xylenes typical of gasoline contamination. Groundwater collected ta B2-OW showed 3.5 ppb of xylenes. Potential sources include the former Texaco station or possibly the former service station at 10 Deerfield Road. An existing fuel oil tank also reportedly remains beneath the adjacent hotel parking facility (8).

The available subsurface information for this portion of the site suggests that the fill may contain low levels of petroleum and metals contamination that may require special handling. This material would be classified as "urban fill" in accordance with DEP guidelines. Additional explorations and testing will likely be required to further characterize the large volume of soils for off-site disposal.

G. Summary of Environmental Conditions

The following is a summary of the findings of this environmental investigation:

1. The site is currently listed as a "Location to be Investigated," under preliminary assessment status, by the Massachusetts Department of Environmental Protection (12).

2. Near surface fill material in the western portion of the site, primarily on the north side, in the vicinity of the former Texaco Station parcel are contaminated with petroleum products. Elevated TPH levels, and increasing VOC concentrations were measured with depth to the water table. The identified soil contamination apparently does not extend into the natural soils below the water table. In addition, some residual contamination was identified at the water table in the southerly portion of the Texaco parcel in areas where soil remediation activities were previously undertaken.

3. Groundwater beneath the former Texaco Station parcel indicates BTEX contamination related to past petroleum releases on-site. MEK (2-butanone) was

also identified in groundwater (B7-OW) and is probably also related to past uses of the property.

4. Metal concentrations were identified in soils at the site. However, the levels are within ranges typically identified in soils except for levels detected in the vicinity of a former waste oil tank and lead levels typical of urban fill identified in the eastern portion of the site. These elevated levels are above normal ranges and will require special handling during construction.

5. No additional sources of contamination were identified at the site beyond that of the former gasoline station. Current use of the site as a parking area is apparently not impacting environmental conditions at the site.

6. Although this evaluation confirms that oil and hazardous material do exist beneath the site, an imminent hazard to public health and safety currently does not appear to exist.

7. On-site fill soil will need to be further classified for off-site disposal. Currently, soils on the easterly portion of the site and the southerly portion of the Texaco site would be classified as "urban fill" and exhibit low levels of petroleum contamination. The fill soils on the northerly portion of the Texaco site indicate higher levels of petroleum contamination and will most likely require off-site disposal at a lined landfill or recycling. Contaminated soils identified in the vicinity of a former waste oil tank may require handling as a RCRA characteristic waste, due to the presence of elevated levels of metals (eg. TP.4-S1 Table III).

8. Groundwater at the site contains low levels of VOCs and may require treatment prior to discharge during construction.

LIMITATIONS

This document is based, in part, on the initial environmental assessment report prepared by Haley & Aldrich entitled "Environmental Assessment, Proposed School of Management Building Site, Boston University, Boston, Massachusetts," dated June 1992.

The conclusions provided in this document by Haley & Aldrich, Inc., are based solely on the scope of work conducted and the sources of information referenced in the initial environmental assessment report. Additional information is currently being gathered and evaluated by Haley & Aldrich, Inc., therefore our conclusions and recommendations may be reviewed and modified if necessary.

The work performed by Haley & Aldrich, Inc. is subject tot he terms and conditions stated in our proposal dated 18 December 1991. This work has been undertaken in accordance with generally accepted environmental consulting practices. No other warranty, express or implied, is made. The contents of this document may not be copied, provided, or otherwise communicated, in whole or in part, to any party without the prior written consent of Haley & Aldrich, Inc.

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Enclosures

Table I - Summary of Groundwater Elevation Data
Table II - Summary of Soil PID Screening Data and GC Screening Data
Table III - Soil Analytical Results
Table IV - Groundwater Analytical Results

LIST OF REFERENCES

1. U.S.G.S. Topographic Quadrangle, Boston, South, Massachusetts, 1970, to a scale of 1:24,000.

2. "Topographic and Planimetric Survey, City of Boston, Boston, Massachusetts", Boston Redevelopment Authority, 1962, sheets 23N-9E and 24N-9E, to a scale of 1:1200.

3. "Topographic Site Plan, Boston University, 587-599 Commonwealth Avenue, Boston, Massachusetts", Harry R. Feldman, Inc. 6 January 1992, to a scale of 1:20.

4. "Plan of Back Bay, Showing Improvements on Streets and Estates From Latest Surveys", William H. Whitney, 1814, 1836, 1851, 1861, 1882, and 1888, to a scale of 1:500.

5. "Atlas of the City of Boston, Massachusetts", G.W. Bromley, Philadelphia, 1882, 1890, 1902.

6. "Atlas of the City of Boston, Massachusetts", G.M. Hopkins, 1874.

7. Haley & Aldrich, Inc., Building Department file review, 23 January 1992.

8. Boston Fire Department, file review conducted by Boston Fire Prevention Office personnel, 22 January 1992.

9. Haley & Aldrich, Inc., City of Boston Directory review, 1924, 1929, 1937, 1938, 1942, 1947, 1954, 1958, 1966, 1972, 1978.

10. "Maps of the City of Boston", Volume 2, Sanborn Map Company, 1937, 1951, 1963.

11. "Hydrogeologic Studies, 140 Bay State Road and 601 Commonwealth Avenue, Boston, Massachusetts", Goldberg-Zoino & Associates, Inc. December 1986.

12. Haley & Aldrich, Inc., file review Massachusetts Department of Environmental Protection, Northeast Region Office, Woburn, Massachusetts, 15 January 1992.

13. Groundwater Technology, Inc., correspondence with Texaco Refining and marketing, Inc., September 1983 to May 1987, provided by Boston University.

LIST OF REFERENCES
(Continued)

14. Boston University memorandum, 140 Bay State Road, Oil in Dining Hall Floor, 12 March 1986.

15. "Final Report, Site Investigation, Texaco Service Station, 601 Commonwealth Avenue, Boston, Massachusetts". Groundwater Technology, Inc., May 1986.

16. "Report on the Supervision of Tank and Soil Removal, 601 Commonwealth Avenue, Boston, Massachusetts", Groundwater Technology, Inc., 1 May 1987.

17. "Toxicological Profile for 2-butanone", U.S. Department of Health and Human Services Draft, February 1991.

18. "Toxicological Profile for 1,2-dichloroethane", U.S. Environmental Protection Agency, December 1989.

TABLE I
SUMMARY OF GROUNDWATER ELEVATION DATA
BOSTON UNIVERSITY SCHOOL OF MANAGEMENT
BOSTON, MASSACHUSETTS

OBSERVATION WELL DESIGNATION	REFERENCE POINT AND ELEVATION (feet)	DEPTH OF SCREENED INTERVAL (feet)	SCREENED GEOLOGIC UNIT	MONITORING DATE	DEPTH TO GROUNDWATER (feet)	GROUNDWATER ELEVATION (feet)
B1-OW	Top Casing 20.27	5.5 - 15.5	FILL/O. SILT	27-Dec-91	11.0	9.27
				30-Dec-91	10.9	9.37
				31-Dec-91	10.9	9.37
				02-Jan-92	11.0	9.27
				06-Jan-92	10.8	9.47
				11-Feb-92	11.3	8.97
B2-OW	Top Casing 18.31	5.5 - 15.5	FILL/O. SILT	27-Dec-91	8.1	10.21
				30-Dec-91	7.8	10.51
				31-Dec-91	8.0	10.31
				02-Jan-92	8.0	10.31
				06-Jan-92	7.1	11.21
				11-Feb-92	8.1	10.21
				07-Nov-92	8.35	9.96
B3-PZ	Top Casing 18.31	27.0 - 33.0	SAND	02-Jan-92	12.6	5.71
				06-Jan-92	12.2	6.11
				11-Feb-92	13.0	5.31
				07-Nov-92	13.00	5.31
B4-OW	Top Casing 20.85	5.8 - 15.8	FILL/O. SILT	30-Dec-91	12.4	8.45
				31-Dec-91	12.5	8.35
				02-Jan-92	12.5	8.35
				06-Jan-92	12.1	8.75
				11-Feb-92	12.5	8.35
				07-Nov-92	12.58	8.27
B5-OW	Ground Surface 20.32	5.5 - 15.5	FILL/PEAT	31-Dec-91	11.8	8.52
				02-Jan-92	12.5	7.82
				06-Jan-92	10.9	9.42
				11-Feb-92	11.8	8.52
				07-Nov-92	12.12	8.20
B6-OW	Ground Surface 18.65	5.5 - 15.5	FILL/PEAT	02-Jan-92	12.1	6.55
				06-Jan-92	8.9	9.75
				11-Feb-92	9.4	9.25
				07-Nov-92	9.73	8.92
B7-OW	Ground Surface 18.84	5.0 - 15.0	FILL/O. SILT	02-Jan-92	6.0	12.84
				06-Jan-92	10.0	8.84
				11-Feb-92	10.9	7.94
				07-Nov-92	10.75	8.09

NOTES:

1. Depths measured relative to listed reference point.
2. Elevations referenced to Boston City Base Datum, which is 5.65 ft. below the National Geodetic Vertical Datum of mean sea level.

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TABLE II
SUMMARY OF SOIL PID SCREENING DATA
BOSTON UNIVERSITY SCHOOL OF MANAGEMENT
BOSTON, MASSACHUSETTS

SAMPLE DESIGNATION	SAMPLING DATE	SAMPLE DEPTH (feet)	GROUND-WATER DEPTH (feet)	SOIL TYPE	SAMPLE READING (ppm)	BACK-GROUND READING (ppm)	SUBMITTED FOR CHEMICAL ANALYSES	COMMENTS
B1-S1	23-Dec-91	0.5 - 2.5	11.0	FILL	**2.0**	1.2		
B1-S2	23-Dec-91	4.0 - 6.0	11.0	FILL	**7.8**	1.2		
B1-S3	23-Dec-91	6.0 - 8.0	11.0	FILL	**6.6**	1.2	X	
B1-S4	23-Dec-91	9.0 - 11.0	11.0	FILL	**5.8**	1.2	X	
B1-S5	23-Dec-91	11.0 - 12.0	11.0	FILL	**3.4**	1.2		
B1-S5A	23-Dec-91	12.0 - 13.0	11.0	ORGANIC SILT	**2.2**	1.2		
B1-S6	23-Dec-91	14.0 - 16.0	11.0	ORGANIC SILT	**2.0**	1.2		
B1-S7	23-Dec-91	19.0 - 21.0	11.0	ORGANIC SILT	**3.6**	1.2		
B1-S8	23-Dec-91	22.0 - 24.0	11.0	MARINE SAND	**4.6**	1.2		
B1-S9	23-Dec-91	24.0 - 25.0	11.0	MARINE SAND	**3.8**	1.2		
B1-S10	23-Dec-91	29.0 - 31.0	11.0	MARINE SAND	**2.0**	1.2		
B1-S11	23-Dec-91	34.0 - 36.0	11.0	MARINE SAND	**1.8**	1.2		
B1-S12	23-Dec-91	39.0 - 40.5	11.0	MARINE SAND	**1.4**	1.2		
B2-S1	23-Dec-91	0.0 - 2.0	8.0	FILL	**3.0**	1.2		
B2-S2	23-Dec-91	4.0 - 6.0	8.0	FILL	**4.2**	1.2		
B2-S3	23-Dec-91	6.0 - 8.0	8.0	FILL	**5.6**	1.2	X	
B2-S4	23-Dec-91	8.0 - 8.5	8.0	FILL	**5.4**	1.2		
B2-S4A	23-Dec-91	8.5 - 10.0	8.0	MARINE SAND	**3.0**	1.2		
B2-S5	23-Dec-91	14.0 - 16.0	8.0	MARINE SAND	**2.8**	1.2		
B2-S6	23-Dec-91	19.0 - 21.0	8.0	MARINE SAND	**2.4**	1.2		
B2-S7	23-Dec-91	24.0 - 26.0	8.0	MARINE SAND	**2.4**	1.2		
B2-S8	23-Dec-91	29.0 - 31.0	8.0	MARINE SAND	**1.6**	1.2		

(continued)

TABLE II (continued)
SUMMARY OF SOIL PID SCREENING DATA
BOSTON UNIVERSITY SCHOOL OF MANAGEMENT
BOSTON, MASSACHUSETTS

SAMPLE DESIGNATION	SAMPLING DATE	SAMPLE DEPTH (feet)	GROUND-WATER DEPTH (feet)	SOIL TYPE	SAMPLE READING (ppm)	BACK-GROUND READING (ppm)	SUBMITTED FOR CHEMICAL ANALYSES	COMMENTS
B3-S1	26-Dec-91	0.5 - 2.5	12.6	FILL	**2.0**	1.6		
B3-S2	26-Dec-91	4.0 - 6.0	12.6	FILL	**146**	1.6		
B3-S3	26-Dec-91	6.0 - 8.0	12.6	FILL	**2.8**	1.6		
B3-S4	26-Dec-91	8.0 - 8.5	12.6	FILL	**2.4**	1.6	X	
B3-S4A	26-Dec-91	8.5 - 10.0	12.6	ORGANIC SILT	**2.0**	1.6		
B3-S5	26-Dec-91	14.0 - 16.0	12.6	PEAT	**2.4**	1.6		
B3-S6	26-Dec-91	19.0 - 21.0	12.6	MARINE SAND	**6.6**	1.6		
B3-S7	26-Dec-91	24.0 - 25.0	12.6	MARINE SAND	**5.2**	0.8		
B3-S8	26-Dec-91	29.0 - 31.0	12.6	MARINE SAND	**7.2**	0.8		
B3-S9	26-Dec-91	34.0 - 36.0	12.6	MARINE SAND	**3.4**	0.8		
B4-S1	26-Dec-91	0.5 - 2.5	12.5	FILL	**3.6**	1.6		
B4-S2	26-Dec-91	4.0 - 6.0	12.5	FILL	**12.4**	1.6	X	
B4-S3	26-Dec-91	6.0 - 8.0	12.5	FILL	**3.0**	1.6		
B4-S4	26-Dec-91	8.0 - 10.0	12.5	FILL	**2.6**	1.6	X	
B4-S5	26-Dec-91	14.0 - 16.0	12.5	ORGANIC SILT	**4.8**	1.6		
B4-S6	26-Dec-91	19.0 - 21.0	12.5	ORGANIC SILT	**2.0**	1.6		
B4-S7	26-Dec-91	24.0 - 26.0	12.5	MARINE SAND	**8.6**	1.6		
B4-S8	26-Dec-91	29.0 - 31.0	12.5	MARINE SAND	**22**	1.6	X	
B4-S9	26-Dec-91	34.0 - 36.0	12.5	MARINE SAND	**1.8**	1.6		

(continued)

TABLE II (continued)
SUMMARY OF SOIL PID SCREENING DATA
BOSTON UNIVERSITY SCHOOL OF MANAGEMENT
BOSTON, MASSACHUSETTS

SAMPLE DESIGNATION	SAMPLING DATE	SAMPLE DEPTH (feet)	GROUND-WATER DEPTH (feet)	SOIL TYPE	SAMPLE READING (ppm)	BACK-GROUND READING (ppm)	SUBMITTED FOR CHEMICAL ANALYSES	COMMENTS
B5-S1	27-Dec-91	0.5 - 2.5	10.9	FILL	**2.4**	0.8		
B5-S2	27-Dec-91	4.0 - 6.0	10.9	FILL	-	-		NO SAMPLE RECOVERY
B5-S3	27-Dec-91	6.0 - 8.0	10.9	FILL	**1.6**	0.8		
B5-S4	27-Dec-91	8.0 - 10.0	10.9	FILL	**1.6**	0.8		
B5-S5	27-Dec-91	14.0 - 16.0	10.9	PEAT	**7.0**	0.8		
B5-S6	27-Dec-91	19.0 - 21.0	10.9	ORGANIC SILT	**1.8**	0.8		
B5-S7	27-Dec-91	24.0 - 26.0	10.9	MARINE SAND	**1.4**	0.8		
B5-S8	27-Dec-91	29.0 - 31.0	10.9	MARINE SAND	**1.2**	0.8		
B5-S9	27-Dec-91	34.0 - 36.0	10.9	MARINE SAND	-	-		NO SAMPLE RECOVERY
B5-S10	27-Dec-91	39.0 - 41.0	10.9	MARINE SAND	**2.4**	0.8		
B6-S1	30-Dec-91	0.5 - 2.5	8.9	FILL	**42**	0.8	X	
B6-S2	30-Dec-91	4.0 - 6.0	8.9	FILL	**28**	0.8		
B6-S3	30-Dec-91	6.0 - 8.0	8.9	FILL	**58**	0.8	X	
B6-S4	30-Dec-91	8.0 - 10.0	8.9	FILL	**>200**	0.8	X	
B6-S5	30-Dec-91	14.0 - 16.0	8.9	PEAT	**2.4**	0.8		
B6-S6	30-Dec-91	19.0 - 21.0	8.9	PEAT	**1.4**	0.8		
B6-S7	30-Dec-91	24.0 - 26.0	8.9	GRAVEL	**2.6**	0.8		POOR SAMPLE RECOVERY
B6-S8	30-Dec-91	29.0 - 31.0	8.9	MARINE SAND	**3.2**	0.8		

(continued)

TABLE II (continued)
SUMMARY OF SOIL PID SCREENING DATA
BOSTON UNIVERSITY SCHOOL OF MANAGEMENT
BOSTON, MASSACHUSETTS

SAMPLE DESIGNATION	SAMPLING DATE	SAMPLE DEPTH (feet)	GROUND-WATER DEPTH (feet)	SOIL TYPE	SAMPLE READING (ppm)	BACK-GROUND READING (ppm)	SUBMITTED FOR CHEMICAL ANALYSES	COMMENTS
B7-S1	02-Jan-92	0.5 - 2.5	10.0	FILL	**34**	0.8	X	
B7-S2	02-Jan-92	4.0 - 6.0	10.0	FILL	**24**	0.8		POOR SAMPLE RECOVERY
B7-S3	02-Jan-92	6.0 - 8.0	10.0	FILL	**5.6**	0.8		
B7-S4	02-Jan-92	8.0 - 8.5	10.0	FILL	**17.8**	0.8		
B7-S4A	02-Jan-92	8.5 - 10.0	10.0	ORGANIC SILT	**>200**	0.8	X	
B7-S5	02-Jan-92	14.0 - 16.0	10.0	ORGANIC SILT	0.8	0.8		

(continued)

TABLE II
SUMMARY OF SOIL PID SCREENING DATA
BOSTON UNIVERSITY SCHOOL OF MANAGEMENT
BOSTON, MASSACHUSETTS

SAMPLE DESIGNATION	SAMPLING DATE	SAMPLE DEPTH (feet)	GROUND-WATER DEPTH (feet)	SOIL TYPE	SAMPLE READING (ppm)	BACK-GROUND READING (ppm)	SUBMITTED FOR CHEMICAL ANALYSES	COMMENTS
TP-1-S1	07-Nov-92	0.0 - 4.0	12.0	FILL	**80**	0.0	X	strong gasoline odor
TP-1-S2	07-Nov-92	8.0 - 12.0	12.0	ORGANIC SILT	**125**	0.0	X	strong gasoline odor
TP-2-S1	07-Nov-92	0.5 - 5.0	12.0	FILL	0.0	0.0	X	
TP-2-S2	07-Nov-92	10.0 - 12.0	12.0	SAND/SILT	**0.4**	0.0	X	
TP-3-S1	07-Nov-92	1.0 - 4.0	12.0	FILL	**0.8**	0.0	X	
TP-3-S2	07-Nov-92	8.0 - 12.0	12.0	FILL/SAND	**200**	0.0	X	strong gasoline odor
TP-4-S1	08-Nov-92	0.5 - 8.0	-	FILL	0.0	0.0	X	former waste oil tank excavation
TP-5-S1	07-Nov-92	0.5 - 7.0	11.0	FILL	**0.6**	0.0	X	replacement fill following tank removals
TP-5-S2	07-Nov-92	11.0 - 12.0	11.0	FILL	**150**	0.0	X	petroleum staining and gasoline odor
TP-5-S3	07-Nov-92	>12.0	11.0	ORGANIC SILT	**>200**	0.0	X	petroleum staining and gasoline odor
TP-6-S1	07-Nov-92	0.5 - 9.0	-	FILL	0.0	0.0	X	replacement fill following tank removals
TP-7-S1	08-Nov-92	0.5 - 5.0	10.0	FILL	0.0	0.0	X	
TP-7-S2	08-Nov-92	8.5 - 10.0	10.0	FILL	0.0	0.0	X	
TP-7-S3	08-Nov-92	10.0 - 11.0	10.0	ORGANIC SILT	0.0	0.0	X	
TP-8-S1	08-Nov-92	0.5 - 6.0	11.0	FILL	0.0	0.0	X	
TP-8-S2	08-Nov-92	7.5 - 11.0	11.0	FILL	0.0	0.0	X	
TP-9-S1	08-Nov-92	0.5 - 5.0	11.5	FILL	**0.2**	0.0	X	ashy fill
TP-9-S2	08-Nov-92	5.0 - 11.0	11.5	FILL	0.0	0.0	X	ashy fill
TP-9-S3	08-Nov-92	11.0 - 12.0	11.5	ORGANIC SILT	0.0	0.0	X	

(continued)

TABLE II (continued)
SUMMARY OF PID SCREENING DATA
BOSTON UNIVERSITY SCHOOL OF MANAGEMENT
BOSTON, MASSACHUSETTS

SAMPLE DESIGNATION	SAMPLING DATE	SAMPLE DEPTH (feet)	GROUND-WATER DEPTH (feet)	SOIL TYPE	SAMPLE READING (ppm)	BACK-GROUND READING (ppm)	SUBMITTED FOR CHEMICAL ANALYSES	COMMENTS
TP-10-S1	08-Nov-92	1.0 - 5.0	8.5	FILL	0.0	0.0	X	
TP-10-S2	08-Nov-92	2.0 - 4.0	8.5	SILT/PEAT	**0.2**	0.0	X	
TP-10-S3	08-Nov-92	4.0 - 6.0	8.5	ORGANIC SILT	**0.2**	0.0	X	
TP-11-S1	08-Nov-92	1.0 - 6.0	10.0	FILL	0.2	0.2	X	
TP-11-S2	08-Nov-92	6.0 - 10.0	10.0	FILL	0.2	0.2	X	
TP-12-S1	11-Nov-92	1.0 - 6.0	9.0	FILL	**0.8**	0.0	X	
TP-12-S2	11-Nov-92	8.0 - 10.0	9.0	ORGANIC SILT	0.0	0.0	X	
TP-13-S1	11-Nov-92	1.0 - 7.0	11.0	FILL	**1.2**	0.8	X	
TP-13-S2	11-Nov-92	7.0 - 10.0	11.0	ORGANIC SILT	0.2	0.2	X	
TP-13-S3	11-Nov-92	10.0 - 11.0	11.0	ORGANIC SILT	0.2	0.2	X	
TP-14-S1	11-Nov-92	1.0 - 6.0	10.0	FILL	0.0	0.0	X	
TP-14-S2	11-Nov-92	6.0 - 8.0	10.0	FILL	0.0	0.0	X	
TP-14-S3	11-Nov-92	10.0 - 11.0	10.0	ORGANIC SILT	0.0	0.0	X	
TP-16-S1	11-Nov-92	1.0 - 8.0	-	FILL	**0.8**	0.0	X	
TP-17-S1	11-Nov-92	0.0 - 8.0	-	FILL	0.0	0.0	X	replacement fill following tank removals

NOTES AND ABBREVIATIONS

1. ppm: parts per million.
2. - : groundwater not observed while completing exploration.
3. Readings taken with an HNU Systems Model PI-101 photoionization detector equipped with an 10.2 eV lamp.
4. Readings taken of the headspace in soil sample jars covered with aluminum foil.
5. Readings represent concentrations of volatile organic compounds in headspace air as compared to a benzene-equivalent standard.
6. Readings for boring program samples taken in laboratory, readings for test pit samples taken in field.
7. PID calibrated prior to use in accordance with manufacturer's specifications.
8. Background readings represent instrument response in ambient air prior to insertion of probe into sample headspace.

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TABLE III
SUMMARY OF GAS CHROMATOGRAPH SCREENING DATA
BOSTON UNIVERSITY SCHOOL OF MANAGEMENT
BOSTON, MASSACHUSETTS

SAMPLE DESIGNATION	SAMPLING DATE	BENZENE (ug/l)	TOLUENE (ug/l)	ETHYL-BENZENE (ug/l)	XYLENES (ug/l)	OTHER VOCs (ug/l)	COMMENTS
SOIL SAMPLES							
B1-S3	23-DEC-91	ND	**1.2**	**5.0**	**1.6**	**sec-butylbenzene 32.0**	Slight petroleum hydrocarbon pattern.
B1-S4	23-DEC-91	ND	**TR (<1)**	ND	ND	ND	Slight petroleum hydrocarbon pattern.
B2-S3	23-DEC-91	**66**	**30**	**2**	**36**	ND	Late eluting petroleum hydrocarbon pattern. Gasoline/oil mix.
B3-S2	26-DEC-91	ND	ND	ND	ND	ND	
GROUNDWATER SAMPLES							
B1-OW	06-JAN-92	ND	ND	ND	ND	ND	
B2-OW	06-JAN-92	ND	ND	ND	**2**	ND	
B3-PZ	06-JAN-92	ND	**2.1**	ND	**1.7**	ND	

NOTES AND ABBREVIATIONS:

1. VOCs: volatile organic compounds. The unit ug/l is equivalent to ppb (parts per billion).
2. ND: compound not detected above quantitation limit.
3. TR: compound identified at concentration less than quantitation limit (trace).

TABLE III
SUMMARY OF SOIL QUALITY DATA - BORING PROGRAM
BOSTON UNIVERSITY SCHOOL OF MANAGEMENT
BOSTON, MASSACHUSETTS

SAMPLE DESIGNATION	B1-S3	B1-S4	B2-S3	B3-S4	B4-S2	B4-S4	B4-S8	B6-S1
SAMPLING DATE	23-Dec-91	23-Dec-91	23-Dec-91	26-Dec-91	26-Dec-91	26-Dec-91	26-Dec-91	31-Dec-91
SAMPLE DEPTH (feet)	6.0 - 8.0	9.0 - 11.0	0.5 - 5.0	8.0 - 8.5	4.0 - 6.5	8.0 - 10.0	29.0 - 31.0	0.5 - 2.5
GROUNDWATER DEPTH (feet)	10.7	10.7	7.1	12.2	12.1	12.1	12.1	8.9
SOIL TYPE	FILL	FILL	FILL	FILL	FILL	FILL	MARINE SAND	FILL
VOLATILE ORGANIC COMPOUNDS (ug/kg)								
acetone	-	-	-	ND	ND	-	-	ND
chloroform	-	-	-	ND	ND	-	-	ND
benzene	-	-	-	ND	ND	-	-	**3.4**
ethylbenzene	-	-	-	ND	ND	-	-	**4.4**
2-butanone	-	-	-	ND	ND	-	-	ND
xylenes (total)	-	-	-	ND	ND	-	-	**16.0**
ACID/BASE/NEUTRAL EXTRACTABLE COMPOUNDS (ug/kg)								
naphthalene	-	-	-	-	-	-	-	-
acenaphthene	-	-	-	-	-	-	-	-
acenaphthylene	-	-	-	-	-	-	-	-
fluorene	-	-	-	-	-	-	-	-
anthracene	-	-	-	-	-	-	-	-
fluoranthene	-	-	-	-	-	-	-	-
phenanthrene	-	-	-	-	-	-	-	-
benzo(a)anthracene	-	-	-	-	-	-	-	-
chrysene	-	-	-	-	-	-	-	-
pyrene	-	-	-	-	-	-	-	-
benzo(b)fluoranthene	-	-	-	-	-	-	-	-
benzo(k)fluoranthene	-	-	-	-	-	-	-	-
benzo(g,h,i,)perylene	-	-	-	-	-	-	-	-
benzo(a)pyrene	-	-	-	-	-	-	-	-
Ideno(1,2,3-cd)pyrene	-	-	-	-	-	-	-	-
dibenzo(a,h)anthracene	-	-	-	-	-	-	-	-

(continued)

TABLE III (continued)
SUMMARY OF SOIL QUALITY DATA - BORING PROGRAM
BOSTON UNIVERSITY SCHOOL OF MANAGEMENT
BOSTON, MASSACHUSETTS

SAMPLE DESIGNATION	B1-S3	B1-S4	B2-S3	B3-S4	B4-S2	B4-S4	B4-S8	B6-S1
SAMPLING DATE	23-Dec-91	23-Dec-91	23-Dec-91	26-Dec-91	26-Dec-91	26-Dec-91	26-Dec-91	31-Dec-91
SAMPLE DEPTH (feet)	6.0 - 8.0	9.0 - 11.0	0.5 - 5.0	8.0 - 8.5	4.0 - 6.5	8.0 - 10.0	29.0 - 31.0	0.5 - 2.5
GROUNDWATER DEPTH (feet)	10.7	10.7	7.1	12.2	12.1	12.1	12.1	8.9
SOIL TYPE	FILL	FILL	FILL	FILL	FILL	FILL	MARINE SAND	FILL
METALS (mg/kg)								
arsenic	**9.1**	-	-	**12**	-	**2.5**	-	-
cadmium	ND	-	-	ND	-	ND	-	-
chromium	**25**	-	-	**10**	-	**11**	-	-
copper	**23**	-	-	**42**	-	**18**	-	-
mercury	ND	-	-	**0.50**	-	ND	-	-
nickel	**11**	-	-	**12**	-	**10**	-	-
lead	**59**	-	-	**2500**	-	**10**	-	-
silver	**3.6**	-	-	**4.4**	-	**3.1**	-	-
zinc	**34**	-	-	**550**	-	**42**	-	-
PESTICIDES (mg/kg)	-	-	-	-	-	-	-	-
PCBs (mg/kg)								
aroclor 1260	-	-	-	-	-	-	-	-
PETROLEUM HYDROCARBONS (mg/kg)	**150**	ND	**290**	**70**	**190**	-	ND	**35**
pH OF SOIL	-	-	-	-	-	-	-	-
IGNITABILITY (deg C)	-	-	-	-	-	-	-	-
REACTIVE CYANIDE (mg/kg)	-	-	-	-	-	-	-	-
TOTAL CYANIDE (mg/kg)	-	-	-	-	-	-	-	-
REACTIVE SULFIDE (mg/kg)	-	-	-	-	-	-	-	-

(continued)

TABLE III (continued)
SUMMARY OF SOIL QUALITY DATA - BORING PROGRAM
BOSTON UNIVERSITY SCHOOL OF MANAGEMENT
BOSTON, MASSACHUSETTS

SAMPLE DESIGNATION	B6-S3	B6-S4	B7-S1	B7-S4A
SAMPLING DATE	31-Dec-91	31-Dec-91	02-Jan-92	02-Jan-92
SAMPLE DEPTH (feet)	6.0 - 8.0	8.0 - 10.0	0.5 - 2.5	8.5 - 10.0
GROUNDWATER DEPTH (feet)	8.9	8.9	10.0	10.0
SOIL TYPE	FILL	FILL	FILL	MARINE SAND
VOLATILE ORGANIC COMPOUNDS (ug/kg)				
acetone	ND	ND	ND	ND
chloroform	ND	ND	ND	ND
benzene	**3.4**	ND	ND	ND
ethylbenzene	**4.4**	**300**	ND	ND
2-butanone	ND	**900**	**140**	ND
xylenes (total)	**13**	**160**	ND	ND
ACID/BASE/NEUTRAL EXTRACTABLE COMPOUNDS (ug/kg)				
naphthalene	-	-	-	-
acenaphthene	-	-	-	-
acenaphthylene	-	-	-	-
fluorene	-	-	-	-
anthracene	-	-	-	-
fluoranthene	-	-	-	-
phenanthrene	-	-	-	-
benzo(a)anthracene	-	-	-	-
chrysene	-	-	-	-
pyrene	-	-	-	-
benzo(b)fluoranthene	-	-	-	-
benzo(k)fluoranthene	-	-	-	-
benzo(g,h,l,)perylene	-	-	-	-
benzo(a)pyrene	-	-	-	-
ideno(1,2,3-cd)pyrene	-	-	-	-
dibenzo(a,h)anthracene	-	-	-	-

(continued)

TABLE III (continued)
SUMMARY OF SOIL QUALITY DATA - BORING PROGRAM
BOSTON UNIVERSITY SCHOOL OF MANAGEMENT
BOSTON, MASSACHUSETTS

SAMPLE DESIGNATION	B6-S3	B6-S4	B7-S1	B7-S4A
SAMPLING DATE	31-Dec-91	31-Dec-91	02-Jan-92	02-Jan-92
SAMPLE DEPTH (feet)	6.0 - 8.0	8.0 - 10.0	0.5 - 2.5	8.5 - 10.0
GROUNDWATER DEPTH (feet)	8.9	8.9	10.0	10.0
SOIL TYPE	FILL	FILL	FILL	MARINE SAND
METALS (mg/kg)				
arsenic	-	-	-	**4.1**
cadmium	-	-	-	ND
chromium	-	-	-	**12**
copper	-	-	-	**15**
mercury	-	-	-	ND
nickel	-	-	-	**10**
lead	-	-	-	**20**
silver	-	-	-	ND
zinc	-	-	-	**56**
PESTICIDES (mg/kg)	-	-	-	-
PCBs (mg/kg)				
aroclor 1260	-	-	-	-
PETROLEUM HYDROCARBONS (mg/kg)	**90**	**86**	**470**	**350**
pH OF SOIL	-	-	-	-
IGNITABILITY (deg C)	-	-	-	-
REACTIVE CYANIDE (mg/kg)	-	-	-	-
TOTAL CYANIDE (mg/kg)	-	-	-	-
REACTIVE SULFIDE (mg/kg)	-	-	-	-

(continued)

TABLE III (continued)
SUMMARY OF SOIL QUALITY DATA - TEST PIT PROGRAM
BOSTON UNIVERSITY SCHOOL OF MANAGEMENT
BOSTON, MASSACHUSETTS

SAMPLE DESIGNATION	TP-1-S1	TP-1-S2	TP-2-S1	TP-2-S2	TP-3-S1	TP-3-S2	TP-4-S1	TP-5-S1
SAMPLING DATE	07-Nov-92	07-Nov-92	07-Nov-92	07-Nov-92	07-Nov-92	07-Nov-92	08-Nov-92	07-Nov-92
SAMPLE DEPTH (feet)	0.0 - 4.0	8.0 - 12.0	0.5 - 5.0	10.0 - 12.0	1.0 - 4.0	8.0 - 12.0	0.5 - 8.0	0.5 - 7.0
GROUNDWATER DEPTH (feet)	12.0	12.0	12.0	12.0	12.0	12.0	*	11.0
SOIL TYPE	FILL	SILT/SAND	FILL	SILT/SAND	FILL	FILL/SANDS	FILL	FILL
VOLATILE ORGANIC COMPOUNDS (ug/kg)								
acetone	ND	ND	ND	ND	ND	ND	ND	ND
chloroform	ND	**1000**	ND	ND	ND	ND	ND	ND
ethylbenzene	ND	**41000**	ND	ND	ND	**8100**	ND	ND
xylenes (total)	ND	**63000**	ND	ND	ND	**16000**	ND	ND
ACID/BASE/NEUTRAL EXTRACTABLE COMPOUNDS (ug/kg)								
naphthalene	-	**510**	-	-	-	-	ND	-
acenaphthene	-	ND	-	-	-	-	**1200**	-
acenaphthylene	-	ND	-	-	-	-	ND	-
fluorene	-	ND	-	-	-	-	**1400**	-
anthracene	-	ND	-	-	-	-	**3000**	-
fluoranthene	-	**620**	-	-	-	-	**9900**	-
phenanthrene	-	**680**	-	-	-	-	**11000**	-
benzo(a)anthracene	-	**280**	-	-	-	-	**6000**	-
chrysene	-	**280**	-	-	-	-	**5800**	-
pyrene	-	**600**	-	-	-	-	**14000**	-
benzo(b)fluoranthene	-	**300**	-	-	-	-	**6900**	-
benzo(k)fluoranthene	-	ND	-	-	-	-	**2300**	-
benzo(g,h,i,)perylene	-	ND	-	-	-	-	**2100**	-
benzo(a)pyrene	-	**240**	-	-	-	-	**5200**	-
ideno(1,2,3-cd)pyrene	-	ND	-	-	-	-	**2500**	-
dibenzo(a,h)anthracene	-	ND	-	-	-	-	**680**	-

(continued)

TABLE III (continued)
SUMMARY OF SOIL QUALITY DATA - TEST PIT PROGRAM
BOSTON UNIVERSITY SCHOOL OF MANAGEMENT
BOSTON, MASSACHUSETTS

SAMPLE DESIGNATION	TP-1-S1	TP-1-S2	TP-2-S1	TP-2-S2	TP-3-S1	TP-3-S2	TP-4-S1	TP-5-S1
SAMPLING DATE	07-Nov-92	07-Nov-92	07-Nov-92	07-Nov-92	07-Nov-92	07-Nov-92	08-Nov-92	07-Nov-92
SAMPLE DEPTH (feet)	0.0 - 4.0	8.0 - 12.0	0.5 - 5.0	10.0 - 12.0	1.0 - 4.0	8.0 - 12.0	0.5 - 8.0	0.5 - 7.0
GROUNDWATER DEPTH (feet)	12.0	12.0	12.0	12.0	12.0	12.0	*	11.0
SOIL TYPE	FILL	SILT/SAND	FILL	SILT/SAND	FILL	FILL/SANDS	FILL	FILL
METALS (mg/kg)								
arsenic	-	**0.89**	**4.3**	-	-	**4.4**	**6.9**	-
cadmium	-	ND	ND	-	-	ND	ND	-
chromium	-	**5.1**	**12**	-	-	**14**	**17**	-
copper	-	ND	**32**	-	-	**27**	**68**	-
mercury	-	ND	**3.6**	-	-	**0.31**	**8.0**	-
nickel	-	**2.9**	**11**	-	-	**8.9**	**14**	-
lead	-	ND	**71**	-	-	**210**	**220**	-
silver	-	ND	ND	-	-	ND	ND	-
zinc	-	**14**	**63**	-	-	**120**	**120**	-
PESTICIDES (mg/kg)	-	ND	-	-	-	-	ND	-
PCBs (mg/kg)								
aroclor 1260	-	ND	-	-	-	-	**0.074**	-
PETROLEUM HYDROCARBONS (mg/kg)	ND	**82**	**1000**	**26**	**65**	**420**	**120**	ND
pH OF SOIL	-	**7.23**	-	-	-	-	**7.79**	-
IGNITABILITY (deg C)	-	ND	-	-	-	-	ND	-
REACTIVE CYANIDE (mg/kg)	-	ND	-	-	-	-	ND	-
TOTAL CYANIDE (mg/kg)	-	ND	-	-	-	-	ND	-
REACTIVE SULFIDE (mg/kg)	-	ND	-	-	-	-	ND	-

(continued)

TABLE III (continued)
SUMMARY OF SOIL QUALITY DATA - TEST PIT PROGRAM
BOSTON UNIVERSITY SCHOOL OF MANAGEMENT
BOSTON, MASSACHUSETTS

SAMPLE DESIGNATION	TP-5-S2	TP-5-S3	TP-6-S1	TP-7-S1	TP-7-S2	TP-7-S3	TP-8-S1	TP-8-S2
SAMPLING DATE	07-Nov-92	07-Nov-92	07-Nov-92	08-Nov-92	08-Nov-92	08-Nov-92	08-Nov-92	08-Nov-92
SAMPLE DEPTH (feet)	11.0 - 12.0	>12.0	0.5 - 9.0	0.5 - 5.0	8.5 - 10.0	10.0 - 11.0	0.5 - 6.0	7.5 - 11.0
GROUNDWATER DEPTH (feet)	11.0	11.0	*	10.0	10.0	10.0	11.0	11.0
SOIL TYPE	FILL	SILT	FILL	FILL	FILL	SILT/SAND	FILL	FILL
VOLATILE ORGANIC COMPOUNDS (ug/kg)								
acetone	ND	-	ND	-	ND	-	-	**63**
chloroform	ND	-	ND	-	ND	-	-	ND
ethylbenzene	**25000**	-	ND	-	ND	-	-	ND
xylenes (total)	**78000**	-	ND	-	ND	-	-	ND
ACID/BASE/NEUTRAL EXTRACTABLE COMPOUNDS (ug/kg)								
naphthalene	**2000**	-	-	-	-	-	-	ND
acenaphthene	**310**	-	-	-	-	-	-	ND
acenaphthylene	ND	-	-	-	-	-	-	ND
fluorene	**430**	-	-	-	-	-	-	ND
anthracene	**710**	-	-	-	-	-	-	**320**
fluoranthene	**2400**	-	-	-	-	-	-	**1300**
phenanthrene	**2800**	-	-	-	-	-	-	**1100**
benzo(a)anthracene	**1100**	-	-	-	-	-	-	**650**
chrysene	**1000**	-	-	-	-	-	-	**650**
pyrene	**2300**	-	-	-	-	-	-	**1300**
benzo(b)fluoranthene	**1100**	-	-	-	-	-	-	**880**
benzo(k)fluoranthene	**450**	-	-	-	-	-	-	**290**
benzo(g,h,i,)perylene	**300**	-	-	-	-	-	-	**240**
benzo(a)pyrene	**840**	-	-	-	-	-	-	**610**
ideno(1,2,3-cd)pyrene	**370**	-	-	-	-	-	-	**290**
dibenzo(a,h)anthracene	ND	-	-	-	-	-	-	ND

(continued)

TABLE III (continued)
SUMMARY OF SOIL QUALITY DATA - TEST PIT PROGRAM
BOSTON UNIVERSITY SCHOOL OF MANAGEMENT
BOSTON, MASSACHUSETTS

SAMPLE DESIGNATION	TP-5-S2	TP-5-S3	TP-6-S1	TP-7-S1	TP-7-S2	TP-7-S3	TP-8-S1	TP-8-S2
SAMPLING DATE	07-Nov-92	07-Nov-92	07-Nov-92	08-Nov-92	08-Nov-92	08-Nov-92	08-Nov-92	08-Nov-92
SAMPLE DEPTH (feet)	11.0 - 12.0	>12.0	0.5 - 9.0	0.5 - 5.0	8.5 - 10.0	10.0 - 11.0	0.5 - 6.0	7.5 - 11.0
GROUNDWATER DEPTH (feet)	11.0	11.0	*	10.0	10.0	10.0	11.0	11.0
SOIL TYPE	FILL	SILT	FILL	FILL	FILL	SILT/SAND	FILL	FILL
METALS (mg/kg)								
arsenic	**3.5**	-	-	-	-	-	-	-
cadmium	ND	-	-	-	-	-	-	-
chromium	**12**	-	-	-	-	-	-	-
copper	**11**	-	-	-	-	-	-	-
mercury	ND	-	-	-	-	-	-	-
nickel	**8.7**	-	-	-	-	-	-	-
lead	**37**	-	-	-	-	-	-	-
silver	ND	-	-	-	-	-	-	-
zinc	**44**	-	-	-	-	-	-	-
PESTICIDES (mg/kg)	ND	-	-	-	-	-	-	ND
PCBs (mg/kg)								
aroclor 1260	ND	-	-	-	-	-	-	ND
PETROLEUM HYDROCARBONS (mg/kg)	**700**	**140**	ND	**220**	**1100**	**64**	**78**	**220**
pH OF SOIL	**7.19**	-	-	-	-	-	-	**8.39**
IGNITABILITY (deg C)	ND	-	-	-	-	-	-	ND
REACTIVE CYANIDE (mg/kg)	ND	-	-	-	-	-	-	ND
TOTAL CYANIDE (mg/kg)	ND	-	-	-	-	-	-	ND
REACTIVE SULFIDE (mg/kg)	ND	-	-	-	-	-	-	ND

(continued)

TABLE III (continued)
SUMMARY OF SOIL QUALITY DATA - TEST PIT PROGRAM
BOSTON UNIVERSITY SCHOOL OF MANAGEMENT
BOSTON, MASSACHUSETTS

SAMPLE DESIGNATION	TP-9-S1	TP-9-S2	TP-9-S3	TP-10-S1	TP-10-S2	TP-10-S3	TP-11-S1	TP-11-S2
SAMPLING DATE	08-Nov-92	08-Nov-92	08-Nov-92	08-Nov-92	08-Nov-92	08-Nov-92	08-Nov-92	08-Nov-92
SAMPLE DEPTH (feet)	0.5 - 5.0	5.0 - 11.0	11.0 - 12.0	1.0 - 5.0	8.0 - 9.5	9.5 - 12.0	1.0 - 6.0	6.0 - 10.0
GROUNDWATER DEPTH (feet)	11.5	11.5	11.5	8.5	8.5	8.5	10.0	10.0
SOIL TYPE	FILL	FILL	SILT	FILL	SILT/PEAT	SILT	FILL	FILL
VOLATILE ORGANIC COMPOUNDS (ug/kg)								
acetone	-	ND	-	-	-	-	-	ND
chloroform	-	ND	-	-	-	-	-	ND
ethylbenzene	-	ND	-	-	-	-	-	ND
xylenes (total)	-	ND	-	-	-	-	-	ND
ACID/BASE/NEUTRAL EXTRACTABLE COMPOUNDS (ug/kg)								
naphthalene	-	-	-	-	-	-	-	ND
acenaphthene	-	-	-	-	-	-	-	ND
acenaphthylene	-	-	-	-	-	-	-	ND
fluorene	-	-	-	-	-	-	-	ND
anthracene	-	-	-	-	-	-	-	ND
fluoranthene	-	-	-	-	-	-	-	710
phenanthrene	-	-	-	-	-	-	-	510
benzo(a)anthracene	-	-	-	-	-	-	-	410
chrysene	-	-	-	-	-	-	-	450
pyrene	-	-	-	-	-	-	-	880
benzo(b)fluoranthene	-	-	-	-	-	-	-	580
benzo(k)fluoranthene	-	-	-	-	-	-	-	220
benzo(g,h,i,)perylene	-	-	-	-	-	-	-	220
benzo(a)pyrene	-	-	-	-	-	-	-	420
ideno(1,2,3-cd)pyrene	-	-	-	-	-	-	-	210
dibenzo(a,h)anthracene	-	-	-	-	-	-	-	ND

(continued)

TABLE III (continued)
SUMMARY OF SOIL QUALITY DATA - TEST PIT PROGRAM
BOSTON UNIVERSITY SCHOOL OF MANAGEMENT
BOSTON, MASSACHUSETTS

SAMPLE DESIGNATION	TP-9-S1	TP-9-S2	TP-9-S3	TP-10-S1	TP-10-S2	TP-10-S3	TP-11-S1	TP-11-S2
SAMPLING DATE	08-Nov-92	08-Nov-92	08-Nov-92	08-Nov-92	08-Nov-92	08-Nov-92	08-Nov-92	08-Nov-92
SAMPLE DEPTH (feet)	0.5 - 5.0	5.0 - 11.0	11.0 - 12.0	1.0 - 5.0	8.0 - 9.5	9.5 - 12.0	1.0 - 6.0	6.0 - 10.0
GROUNDWATER DEPTH (feet)	11.5	11.5	11.5	8.5	8.5	8.5	10.0	10.0
SOIL TYPE	FILL	FILL	SILT	FILL	SILT/PEAT	SILT	FILL	FILL
METALS (mg/kg)								
arsenic	-	**3.6**	-	ND	-	-	-	**4.8**
cadmium	-	ND	-	**1.1**	-	-	-	ND
chromium	-	**12**	-	**16**	-	-	-	**15**
copper	-	**23**	-	**34**	-	-	-	**24**
mercury	-	**0.38**	-	ND	-	-	-	ND
nickel	-	**9.1**	-	**15**	-	-	-	**18**
lead	-	**780**	-	**120**	-	-	-	**36**
silver	-	ND	-	ND	-	-	-	ND
zinc	-	**82**	-	**110**	-	-	-	**79**
PESTICIDES (mg/kg)	-	-	-	-	-	-	-	ND
PCBs (mg/kg)								
aroclor 1260	-	-	-	-	-	-	-	**0.080**
PETROLEUM HYDROCARBONS (mg/kg)	**53**	**130**	ND	**230**	**3000**	**120**	ND	**100**
pH OF SOIL	-	-	-	-	-	-	-	**7.95**
IGNITABILITY (deg C)	-	-	-	-	-	-	-	ND
REACTIVE CYANIDE (mg/kg)	-	-	-	-	-	-	-	ND
TOTAL CYANIDE (mg/kg)	-	-	-	-	-	-	-	ND
REACTIVE SULFIDE (mg/kg)	-	-	-	-	-	-	-	ND

(continued)

TABLE III (continued)
SUMMARY OF SOIL QUALITY DATA - TEST PIT PROGRAM
BOSTON UNIVERSITY SCHOOL OF MANAGEMENT
BOSTON, MASSACHUSETTS

SAMPLE DESIGNATION	TP-12-S1	TP-12-S2	TP-13-S1	TP-13-S2	TP-13-S3	TP-14-S1	TP-14-S2	TP-14-S3
SAMPLING DATE	11-Nov-92	11-Nov-92	11-Nov-92	11-Nov-92	11-Nov-92	11-Nov-92	11-Nov-92	11-Nov-92
SAMPLE DEPTH (feet)	1.0 - 6.0	8.0 - 10.0	1.0 - 7.0	7.0 - 10.0	10.0 - 11.0	1.0 - 6.0	6.0 - 8.0	10.0 - 11.0
GROUNDWATER DEPTH (feet)	9.0	9.0	11.0	11.0	11.0	10.0	10.0	10.0
SOIL TYPE	FILL	SILT	FILL	SILT	SILT	FILL	FILL	SILT
VOLATILE ORGANIC COMPOUNDS (ug/kg)								
acetone	-	-	ND	-	-	-	-	-
chloroform	-	-	ND	-	-	-	-	-
ethylbenzene	-	-	ND	-	-	-	-	-
xylenes (total)	-	-	ND	-	-	-	-	-
ACID/BASE/NEUTRAL EXTRACTABLE COMPOUNDS (ug/kg)								
naphthalene	-	-	ND	-	-	-	-	-
acenaphthene	-	-	ND	-	-	-	-	-
acenaphthylene	-	-	**1600**	-	-	-	-	-
fluorene	-	-	**410**	-	-	-	-	-
anthracene	-	-	**980**	-	-	-	-	-
fluoranthene	-	-	**3500**	-	-	-	-	-
phenanthrene	-	-	**3100**	-	-	-	-	-
benzo(a)anthracene	-	-	**3700**	-	-	-	-	-
chrysene	-	-	**4100**	-	-	-	-	-
pyrene	-	-	**7800**	-	-	-	-	-
benzo(b)fluoranthene	-	-	**3600**	-	-	-	-	-
benzo(k)fluoranthene	-	-	**1300**	-	-	-	-	-
benzo(g,h,i,)perylene	-	-	**1800**	-	-	-	-	-
benzo(a)pyrene	-	-	**3000**	-	-	-	-	-
ideno(1,2,3-cd)pyrene	-	-	**1600**	-	-	-	-	-
dibenzo(a,h)anthracene	-	-	**510**	-	-	-	-	-

(continued)

TABLE III (continued)
SUMMARY OF SOIL QUALITY DATA - TEST PIT PROGRAM
BOSTON UNIVERSITY SCHOOL OF MANAGEMENT
BOSTON, MASSACHUSETTS

SAMPLE DESIGNATION	TP-12-S1	TP-12-S2	TP-13-S1	TP-13-S2	TP-13-S3	TP-14-S1	TP-14-S2	TP-14-S3
SAMPLING DATE	11-Nov-92	11-Nov-92	11-Nov-92	11-Nov-92	11-Nov-92	11-Nov-92	11-Nov-92	11-Nov-92
SAMPLE DEPTH (feet)	1.0 - 6.0	8.0 - 10.0	1.0 - 7.0	7.0 - 10.0	10.0 - 11.0	1.0 - 6.0	6.0 - 8.0	10.0 - 11.0
GROUNDWATER DEPTH (feet)	9.0	9.0	11.0	11.0	11.0	10.0	10.0	10.0
SOIL TYPE	FILL	SILT	FILL	SILT	SILT	FILL	FILL	SILT
METALS (mg/kg)								
arsenic	-	-	**6.5**	-	-	-	-	-
cadmium	-	-	**2.0**	-	-	-	-	-
chromium	-	-	**12**	-	-	-	-	-
copper	-	-	**150**	-	-	-	-	-
mercury	-	-	**0.30**	-	-	-	-	-
nickel	-	-	**13**	-	-	-	-	-
lead	-	-	**580**	-	-	-	-	-
silver	-	-	ND	-	-	-	-	-
zinc	-	-	**120**	-	-	-	-	-
PESTICIDES (mg/kg)	-	-	ND	-	-	-	-	-
PCBs (mg/kg)								
aroclor 1260	-	-	ND	-	-	-	-	-
PETROLEUM HYDROCARBONS (mg/kg)	**110**	**190**	**720**	**56**	**41**	**47**	**100**	ND
pH OF SOIL	-	-	**8.49**	-	-	-	-	-
IGNITABILITY (deg C)	-	-	ND	-	-	-	-	-
REACTIVE CYANIDE (mg/kg)	-	-	ND	-	-	-	-	-
TOTAL CYANIDE (mg/kg)	-	-	ND	-	-	-	-	-
REACTIVE SULFIDE (mg/kg)	-	-	ND	-	-	-	-	-

(continued)

TABLE III (continued)
SUMMARY OF SOIL QUALITY DATA - TEST PIT PROGRAM
BOSTON UNIVERSITY SCHOOL OF MANAGEMENT
BOSTON, MASSACHUSETTS

SAMPLE DESIGNATION	TP-16-S1	TP-17-S1
SAMPLING DATE	11-Nov-92	11-Nov-92
SAMPLE DEPTH (feet)	1.0 - 8.0	0.0 - 8.0
GROUNDWATER DEPTH (feet)	*	*
SOIL TYPE	FILL	FILL
VOLATILE ORGANIC COMPOUNDS (ug/kg)		
acetone	ND	ND
chloroform	ND	ND
ethylbenzene	ND	ND
xylenes (total)	ND	ND
ACID/BASE/NEUTRAL EXTRACTABLE COMPOUNDS (ug/kg)		
naphthalene	-	-
acenaphthene	-	-
acenaphthylene	-	-
fluorene	-	-
anthracene	-	-
fluoranthene	-	-
phenanthrene	-	-
benzo(a)anthracene	-	-
chrysene	-	-
pyrene	-	-
benzo(b)fluoranthene	-	-
benzo(k)fluoranthene	-	-
benzo(g,h,i,)perylene	-	-
benzo(a)pyrene	-	-
ideno(1,2,3-cd)pyrene	-	-
dibenzo(a,h)anthracene	-	-

(continued)

TABLE III (continued)
SUMMARY OF SOIL QUALITY DATA - TEST PIT PROGRAM
BOSTON UNIVERSITY SCHOOL OF MANAGEMENT
BOSTON, MASSACHUSETTS

SAMPLE DESIGNATION	TP-16-S1	TP-17-S1
SAMPLING DATE	11-Nov-92	11-Nov-92
SAMPLE DEPTH (feet)	1.0 - 8.0	0.0 - 8.0
GROUNDWATER DEPTH (feet)	*	*
SOIL TYPE	FILL	FILL
METALS (mg/kg)		
arsenic	-	-
cadmium	-	-
chromium	-	-
copper	-	-
mercury	-	-
nickel	-	-
lead	-	-
silver	-	-
zinc	-	-
PESTICIDES (mg/kg)	-	-
PCBs (mg/kg)		
aroclor 1260	-	-
PETROLEUM HYDROCARBONS (mg/kg)	**180**	ND
pH OF SOIL	-	-
IGNITABILITY (deg C)	-	-
REACTIVE CYANIDE (mg/kg)	-	-
TOTAL CYANIDE (mg/kg)	-	-
REACTIVE SULFIDE (mg/kg)	-	-

NOTES AND ABBREVIATIONS:
1. ND: compound not detected above analytical limit.
2. -: compound or test not analyzed for.
3. *: groundwater not observed while completing exploration.
4. This table includes only those compounds detected during the indicated sampling dates.
5. TP-15 was excavated for geotechnical information and was not sampled.

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TABLE IV
SUMMARY OF GROUNDWATER QUALITY DATA
BOSTON UNIVERSITY SCHOOL OF MANAGEMENT
BOSTON, MASSACHUSETTS

SAMPLE DESIGNATION SAMPLING DATE	B2-OW 08-Nov-92	B4-OW 06-Jan-92	B4-OW 08-Nov-92	B5-OW 06-Jan-92	B5-OW 08-Nov-92	B6-OW 06-Jan-92	B7-OW 06-Jan-92
VOLATILE ORGANIC COMPOUNDS (ug/l)							
benzene	ND	**22**	**13**	ND	ND	**45**	**96**
1,2-dichloroethane	ND	ND	ND	ND	ND	**1.4**	ND
ethylbenzene	ND	**59**	**5.3**	ND	ND	**23**	ND
toluene	ND	**3.3**	ND	ND	ND	**1.4**	ND
carbon disulfide	ND	ND	ND	**7.0**	ND	ND	ND
2-butanone	ND	ND	ND	ND	ND	ND	**600**
total xylenes	**3.5**	**26**	**4.3**	ND	**1.3**	**15**	ND
PETROLEUM HYDROCARBONS (mg/l)	ND	-	**16**	-	**4.0**	-	-

NOTES AND ABBREVIATIONS:

1. ND: compound not detected above instrument analytical limit.
2. The units ug/l and mg/l are equivalent to parts per billion (ppb) and parts per million (ppm), respectively.
3. This table includes only those compounds detected during the indicated sampling dates.
4. -: compound or test not analyzed for.

JPF003B.BUGWDAT.WQ1

This document presents a draft Disposal Management Plan (DMP) for the proposed Boston University School of Management project. The primary elements of the Disposal Management Plan are summarized in Table I.

The environmental tests conducted to date indicate that the on-site contamination is primarily limited to specific areas in the miscellaneous fill unit.

Issues related to soil excavation and disposal, groundwater removal inside the excavation limits, and health and safety are discussed below.

SOIL EXCAVATION AND DISPOSAL

Based upon the results of the exploration, screening, pre-characterization and chemical testing program, the on-site soils, primarily the miscellaneous fill unit, will be classified into one of five categories for disposal. These disposal categories are discussed in a subsequent section of this document.

The following items will be evaluated in connection with soil excavation and disposal at this site.

- Soil Characterization
- On-Site Soil Handling
- Soil Disposal
- Transportation of Materials
- Contingencies

A brief discussion on these items is presented below.

Soil Characterization - Excavated soils will be monitored for visual and olfactory evidence of contamination, including discoloration, texture, odor, etc. Excavation spoils will be pre-categorized in accordance with the criteria indicated below.

Soils will be screened in the field using a Photoionization Detector (PID), and segregated and handled as indicated under this handling and disposal plan. If unanticipated material is encountered this material will be handled under Category E.

Category A - Soils identified where Total Petroleum Hydrocarbons (TPH) has been detected at levels less than 100 parts per million (ppm) and Volatile Organic Compounds (VOC) less than 3 ppm.

Category B - Soils identified where the presence of TPH is greater than 100 ppm, but less than 500 ppm, and VOC less than 10 ppm.

Category C - Soils identified where the presence of TPH is greater than 500 ppm, but less than 1000 ppm, and VOC less than 100 ppm.

Category D - Soils identified where the presence of TPH is greater than 1000 ppm, or are suspected of having elevated TPH levels, and VOC greater than 100 ppm.

Category E - Soils that exhibit unusual visual or olfactory evidence of petroleum contamination due to staining, texture, odor, etc. These soils will be segregated separately, sampled, and tested.

On-Site Soil Handling and Storage - It is planned that the excavated soils will be placed directly into trucks for off-site disposal. However, if excavated soils are stockpiled on-site, the soils will be placed on and covered with polyethylene sheeting. The Contractor will be required to submit procedures for soil stockpiling and handling prior to the start of construction.

Soil Disposal Options - The following disposal options are planned for the respective soil categories:

Category A - Soils would be reused on-site, disposed of as unregulated material, or as cover material at an unlined landfill (NE Region).

Category B - Soils would be disposed of at an unlined landfill (NE Region) with a DEP-signed Bill of Lading.

Category C - Soil could be:

a. Disposed of at an lined landfill (NE Region) with a DEP-signed Bill of Lading, or

b. Recycled at an in-state off-site asphalt batch process facility with a DEP-signed Bill of Lading.

Category D - Soil would be recycled at an in-state off-site asphalt batch process facility with a DEP-signed Bill of Lading.

> Category E - Disposal option would be dependent on TPH and VOC levels and based on DEP criteria. It is anticipated that these soils with higher VOC and TPH levels would require disposal at a lined landfill or recycling.

Transportation of Materials - All material removed from the site will be loaded onto trucks within the site limits. All trucks leaving the site will be covered and cleaned of spilled debris that might fall from the truck during transport.

Material removed from the site will be transported under a Bill of Lading, or Waste Manifest, as appropriate. All receiving landfills/facilities will be approved and disposal coordinated through the DEP, Division of Solid Waste and Bureau of Waste Site Cleanup. Documentation on field monitoring and chemical testing results will be made available to the receiving town via the respective disposal facility.

Contingencies - If during the work, the presence of potentially hazardous conditions are evident due to contamination, work in the area will be suspended. The area will then be secured to prevent the existence of a health risk or release to the environment. The sources of the contamination and the events causing the release will be determined prior to resuming the work. If necessary, the DEP will be notified.

The impact on the work will be evaluated with respect to the disposal options for the material, on-site handling procedures, and the site health and safety program. Procedures will be developed to allow the work to continue in a monitored environment within the guidelines of the health and safety program.

DISPOSAL OF GROUNDWATER AND SURFACE WATER RUNOFF

Contaminated groundwater may be encountered in localized areas, specifically within the near surface miscellaneous fill unit. If contaminated groundwater is encountered, this water will be treated on-site and disposed of in accordance with an approved discharge permit or removed and legally transported and disposed. If contaminated water is transported it will be by a licensed hazardous waste transporter, under a manifest, to a DEP approved disposal/treatment facility.

Surface water runoff will be diverted away from excavations in areas of contaminated soils by ditches, swales or other means.

HEALTH AND SAFETY PLAN

All Contractors will be required to establish a Contractors' health and safety program for the site, and notify their workers of the history of the site and contaminants that may be encountered.

Table I - Summary of Soil Disposal Management Plan

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07-Jul-93 H&A FILE NO. 10874-05 ***DRAFT***
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BOSTON UNIVERSITY
SCHOOL OF MANAGEMENT BUILDING
BOSTON, MASSACHUSETTS

TABLE I - SUMMARY OF SOIL DISPOSAL MANAGEMENT PLAN

SOIL CATERGORY	SOIL CHARACTERIZATION	ON-SITE HANDLING AND STORAGE	SOIL DISPOSAL OPTIONS	TRANSPORTATION OF MATERIALS	COMMENTS
A	TPH < 100 ppm VOC <3 ppm NO VISUAL EVIDENCE OF SOIL CONTAMINATION	REUSE/REMOVE WITHOUT STOCKPILING	UNLINED LANDFILL NE REGION OR REUSE ON SITE	UNREGULATED	
B	100 ppm < TPH < 500 ppm 3 ppm <VOC <10 ppm	REUSE/REMOVE WITHOUT STOCKPILING	UNLINED LANDFILL NE REGION	DEP-SIGNED BILL OF LADING	DEP SOILD WASTE BUREAU APPROVAL REQUIRED
C	500 ppm < TPH < 1000 ppm 10 ppm <VOC <100 ppm	REUSE/REMOVE WITHOUT STOCKPILING	UNLINED LANDFILL OR RECYCLED AT TREATMENT FACILITY OR ASPHALT BATCH PROCESS (OFF SITE)	DEP-SIGNED BILL OF LADING	DEP SOILD WASTE BUREAU APPROVAL REQUIRED
D	TPH > 1000 ppm VOC >100 ppm	REUSE/REMOVE WITHOUT STOCKPILING	RECYCLED AT TREATMENT FACILITY OR ASPHALT BATCH PROCESS (OFF SITE)	DEP-SIGNED BILL OF LADING	DEP SOILD WASTE BUREAU APPROVAL REQUIRED
E	PID > 10 ppm VISUAL EVIDENCE OF SOIL CONTAMINATION	SAMPLE	DISPOSAL DEPENDENT ON CHEMICAL TESTING DATA	WASTE MANIFEST - ASSUME OUT-OF-STATE DISPOSAL	

NOTES:

1. TPH indicates Total Petroleum Hydrocarbons
2. VOC indicates Volatile Organic Compounds
3. PID indicates Photoionization Detector
4. ppm indicates parts per million
5. DEP indicates Department of Environmental Protection
6. NE indicates Northeast

DRAFT
GROUNDWATER PROTECTION PLAN

I. INTRODUCTION

The groundwater protection plan discussed below is planned to be implemented during construction of the Boston University School of Management Building. This plan is part of the geotechnical instrumentation monitoring program that will be undertaken during construction. The purpose of monitoring the groundwater levels is to insure that adverse groundwater lowering does not take place that could impact adjacent foundations, especially those on timber piles.

The temporary earth support has been selected in order to reduce groundwater seepage into the excavation. The permanent structure will be fully waterproofed to not only reduce the potential for groundwater lowering but to prevent seepage into the below-grade basement space.

II. GROUNDWATER MONITORING PLAN

The groundwater monitoring plan consists of the following:

- Geotechnical instruments installed below-grade to monitor groundwater levels.
- Periodic recording of the groundwater levels in the installed instruments.
- Evaluation of measured groundwater levels.
- Remedial measures, if necessary, to maintain the area groundwater levels outside the excavation if these levels are effected by the School of Management construction activities.

The geotechnical monitoring instruments are planned to consist of up to six observation wells that will be installed around the site, outside the excavation limits. The groundwater level in these observation wells is planned to be recorded by Haley & Aldrich prior to, and during, the School of Management construction activities.

It is anticipated that the groundwater level will fluctuate during construction due to numerous factors, including precipitation, water run-off in the street, unrelated construction, utilities and season. However, decrease in water level will be evaluated to assess if BU construction is the cause for the lowering.

III. REMEDIAL ACTION PLAN OR CONTINGENCY PLAN

Construction activities should not require remedial measures. However, remedial measures will be implemented during construction if the groundwater levels are determined to be adversely lowered as a result of construction. These remedial measures might include sealing the leaking wall system and/or recharging the groundwater level outside the excavation limits. The type and extent of a recharge system, if necessary, will depend upon the magnitude of groundwater drawdown outside the excavation limits.

XD407

Appendix C Infrastructure

BOSTON UNIVERSITY - SCHOOL OF MANAGEMENT

WATER CONSUMPTION AND SANITARY FLOW REDUCTION ANALYSIS

Total sanitary discharge is calculated on the following based on Commonwealth of Massachusetts Regulation 314 CMR: Division of Water Pollution Control which was established before use of water saver devices. Proposed building has latest water saver devices on all water supply systems.

Water closets operate with 1.6 gallon per flush in lieu of 3.5 gallon per flush which is a 55% reduction in water usage.

Lavatories with flow restrictors use 0.5 GPM in lieu of 2.5 GPM reducing flow by 80%.

Based on the above listed reductions and other devices operating at normal flow, an overall minimum sanitary discharge reduction of 40% is anticipated for the total building.

Instantaneous water demand is only marginally affected by the use of low water consumption toilets. Peak flow rate is reduced from 25 GPM to 20 GPM which is a reduction by 20%. Instantaneous flow reduction of lavatories with 0.5 GPM flow restrictions is 80%.

Since water closets are the major plumbing component of the instantaneous water flow, a maximum reduction of the building of 20% is anticipated.

BOSTON UNIVERSITY - SCHOOL OF MANAGEMENT

UTILITY DEMAND LOAD CALCULATIONS - 9 FLOORS

A. Sanitary Sewer System

1. Calculated sanitary flow for the proposed project as per Commonwealth of Massachusetts Regulations 314 CMR: Division of Water Pollution Control.

   a) School Occupancy of Building with Cafeteria
   (Floors 1 through 4)
   2,300 students x 15 GPD/person 34,500 GPD

   b) Office Occupancy of Building
   (Floors 5 through 9)
   160,630 SF x 75 GPD/1,000 SF 12,047 GPD
   46,547 GPD

2. Calculated wastewater flow from the air conditioning system.

   a) Cooling tower blowdown per ASHRAE Guide Chapter 20
   1,200 ton capacity x 3 GPM/ton x 0.9% blowdown rate
   x 10 mins/day = 323 GPD maximum

3. Total sanitary discharge generated from the proposed project per day is 46,547 GPD + 323 GPD = 46,870 GPD.

4. Maximum instantaneous sanitary flow is calculated to be 0.6 cubic feet per second.

$$\frac{279\ \text{GPM}}{7.5\ \text{GPF}^3 \times 60\ \text{sec./min.}} = 0.6\ \text{CFS}$$

5. Mitigation: It is anticipated that total sanitary discharge will be reduced by 40% due to water saver devices. (See analysis elsewhere in this report.) Actual anticipated discharge will be 46,870 GPD x 60% = 28,122 GPD.

B. Storm Water Drainage:

1. Maximum flow based on 4 inches/hour rainfall per Massachusetts plumbing code 248 CMR and A.S.P.E.

$$\frac{38{,}000\ \text{SF of roof area X .33 LF/Hr}}{3600\ \text{SEC/HR}} = 3.5\ \text{CFS}$$

C. Water Service: The total maximum water supply demand is 168 GPM (plumbing fixtures) plus 69 GPM (cooling system) equals 237 GPM.

1. Calculated Water Supply Demand For Plumbing
(Per Commonwealth of Massachusetts Fuel Gas and Plumbing Codes)

a) School Occupancy of Building (Floors 1 through 4)

			Hot	Cold	
43	Water Closets	x12FU =	-	516	
9	Urinal	x 6FU =	-	54	
40	Lavatory	x 1FU =	40	40	
8	Mop Receptor	x 2FU =	16	16	
8	Water Cooler	x 1FU =	-	8	
5	Sink	x 2FU =	10	10	
8	Hose Bibb	x 2FU =	-	61	
			66+	660	= 726 x .80 demand factor = 581 FU

b) Office Occupancy of Building (Floors 5 through 9)

			Hot	Cold	
45	Water Closets	x12FU =	-	540	
10	Urinal	x 6FU =	-	60	
55	Lavatory	x 1FU =	55	55	
7	Mop Receptor	x 2FU =	14	14	
7	Water Cooler	x 1FU =	-	7	
10	Sink	x 2FU =	20	20	
10	Hose Bibb	x 2FU =	-	20	
			89	716	= 805 x .40 demand factor = 322 FU

c) Servery/Kitchen (Second Floor)

			Hot	Cold	
3	Sink	x 6FU =	18	18	
1	Soda Dispenser	x 1FU =	-	1	
1	Juice Dispenser	x 1FU =	-	1	
1	Flushing Hose	x 6FU =	6	6	
1	Steamer	x 2FU =	-	2	
2	Ice Machine	x 1FU =	-	2	
			24+	30	= 54 x 1.0 demand factor = 54 FU

d. Kitchen (Fourth Floor)

			Hot	Cold	
1	Dishwasher	x10FU	10	10	
2	Prep Sink	x 6FU	12	12	
2	Work Sink	x 6FU	12	12	
1	Hand Sink	x 1FU	1	1	
1	Disposer	x 6FU	6	6	
1	Flushing Hose	x 6FU	6	6	
1	Pot Sink	x 8FU	8	8	
			55+	55	= 110 x 1.0 demand factor = 110 FU

Total water demand is 581 + 322 + 54 + 110 = 1,067 FU

1,067 fixture units using unit curve for predominantly flush valve system is 210 GPM. Actual use with water saver devices is 210 GPM x 80% = 168 GPM.

2. Make-up water for air conditioning system.

a. Cooling Tower Evaporation loss
3600 GPM System Capacity X 1% = 36 GPM

b. Cooling Tower Blowdown Rate
3600 GPM System Capacity X 0.9% = 33 GPM
69 GPM

3. Calculated water demand for fire protection:

a. Water flow demand per NFPA - 13, 14, and 20.
500 GPM for the first standpipe plus 250 GPM for each additional standpipe.

Standpipe 1	500 GPM
Standpipe 2	250 GPM
Standpipe 3	250 GPM
Standpipe 4	250 GPM
	1,250 GPM

D. Gas Service:

1.	Heating hot water boiler 1	4,750 CFH
	Heating hot water boiler 2	4,750 CFH
	Heating hot water boiler 3	4,750 CFH
	Kitchen Equipment/Misc.	2,500 CFH
		16,750 CFH

E. Electric Service:

The building is anticipated to have an electrical load of approximately 3550 KW with the following breakdown:

1.	Two 650 KW chillers	-	1300 KW
2.	100 horsepower fire pump	-	100 KW
3.	Six 75 horsepower elevators	-	450 KW
4.	Lighting	-	850 KW
5.	General building and receptacle loads	-	850 KW
		Total	3550 KW

At an anticipated 90% power factor, this correlates to a transformer load of 3944 KVA.

BOSTON UNIVERSITY - SCHOOL OF MANAGEMENT

UTILITY DEMAND LOAD CALCULATIONS - 10 FLOORS

A. Sanitary Sewer System

1. Calculated sanitary flow for the proposed project as per Commonwealth of Massachusetts Regulations 314 CMR: Division of Water Pollution Control.

   a) School Occupancy of Building with Cafeteria
   (Floors 1 through 4)
   2,300 students x 15 GPD/person 34,500 GPD

   b) Office Occupancy of Building
   (Floors 5 through 10)
   196,630 SF x 75 GPD/1,000 SF 14,725 GPD
   49,225 GPD

2. Calculated wastewater flow from the air conditioning system.

   a) Cooling tower blowdown per ASHRAE Guide Chapter 20
   1,300 ton capacity x 3 gpm/ton x 0.9% blowdown rate
   x 10 mins/day = 350 GPD maximum

3. Total sanitary discharge generated from the proposed project per day is 49,225 GPD + 350 GPD = 49,575 GPD.

4. Maximum instantaneous sanitary flow is calculated to be 0.7 cubic feet per second.

$$\frac{300\ \text{GPM}}{7.5\ \text{GPF}^3 \times 60\ \text{sec./min.}} = 0.7\ \text{CFS}$$

5. It is anticipated that total sanitary discharge will be reduced by 40% due to water saver devices. (See analysis elsewhere in this report.) Anticipated discharge: 49,575 GPD x 60% = 29,745 GPD.

B. Storm Water Drainage:

1. Maximum flow based on 4 inches/hour rainfall per Massachusetts plumbing code 248 CMR and A.S.P.E.

$$\frac{38{,}000\ \text{SF of roof area} \times .33\ \text{LF/Hr}}{3600\ \text{SEC/HR}} = 3.5\ \text{CFS}$$

C. Water Service: The total maximum water supply demand is 184 GPM (plumbing) plus 74 GPM (cooling system) is 258 GPM.

1. Calculated Water Supply Demand For Plumbing
(Per Commonwealth of Massachusetts Fuel Gas and Plumbing Codes)

a) School Occupancy of Building (Floors 1 through 4)

			Hot	Cold	
43	Water Closets	x12FU =	-	516	
9	Urinal	x 6FU =	-	54	
40	Lavatory	x 1FU =	40	40	
8	Mop Receptor	x 2FU =	16	16	
8	Water Cooler	x 1FU =	-	8	
5	Sink	x 2FU =	10	10	
8	Hose Bibb	x 2FU =	-	61	
			66+	660	= 726 x .80 demand factor = 581 FU

b) Office Occupancy of Building (Floors 5 through 10)

			Hot	Cold	
53	Water Closets	x12FU =	-	636	
12	Urinal	x 6FU =	-	72	
65	Lavatory	x 1FU =	65	65	
8	Mop Receptor	x 2FU =	16	16	
8	Water Cooler	x 1FU =	-	8	
12	Sink	x 2FU =	24	24	
12	Hose Bibb	x 2FU =	-	24	
			105	845	= 950 x .40 demand factor = 380 FU

c) Servery/Kitchen (Second Floor)

			Hot	Cold	
3	Sink	x 6FU =	18	18	
1	Soda Dispenser	x 1FU =	-	1	
1	Juice Dispenser	x 1FU =	-	1	
1	Flushing Hose	x 6FU =	6	6	
1	Steamer	x 2FU =	-	2	
2	Ice Machine	x 1FU =	-	2	
			24+	30	= 54 x 1.0 demand factor = 54 FU

d) Kitchen (Fourth Floor)

			Hot	Cold	
1	Dishwasher	x10FU	10	10	
2	Prep Sink	x 6FU	12	12	
2	Work Sink	x 6FU	12	12	
1	Hand Sink	x 1FU	1	1	
1	Disposer	x 6FU	6	6	
1	Flushing Hose	x 6FU	6	6	
1	Pot Sink	x 8FU	8	8	
			55+	55	= 110 x 1.0 demand factor = 110 FU

Total water demand is 581 + 380 + 54 + 110 = 1,125 FU

1,125 fixture units using unit curve for predominantly flush valve system is 230 GPM. Actual use with water saver devices is 230 GPM x 80% = 184 GPM.

2. Make-up water for air conditioning system.

a. Cooling Tower Evaporation loss
3900 GPM System Capacity X 1% = 39 GPM

b. Cooling Tower Blowdown Rate
3900 GPM System Capacity X 0.9% = 35 GPM
74 GPM

3. Calculated water demand for fire protection:

a. Water flow demand per NFPA - 13, 14, and 20. 500 GPM for the first standpipe plus 250 GPM for each additional standpipe.

Standpipe 1	500 GPM
Standpipe 2	250 GPM
Standpipe 3	250 GPM
Standpipe 4	250 GPM
	1,250 GPM

D. Gas Service:

1.	Heating hot water boiler 1	5,000 CFH
	Heating hot water boiler 2	5,000 CFH
	Heating hot water boiler 3	5,000 CFH
	Kitchen Equipment/Misc.	2,500 CFH
		17,500 CFH

E. Electric Service:

The building is anticipated to have an electrical load of approximately 3850 KW with the following breakdown:

1.	Two 750 KW chillers	-	1500 KW
2.	100 horsepower fire pump	-	100 KW
3.	Six 75 horsepower elevators	-	450 KW
4.	Lighting	-	900 KW
5.	General building and receptacle loads	-	900 KW
		Total	3850 KW

At an anticipated 90% power factor, this correlates to a transformer load of 4278 KVA.

BOSTON UNIVERSITY - SCHOOL OF MANAGEMENT

Response from BSWC (John P. Sullivan) to Secretary Suzan Tierney
Dated 11-18-92

Comment 1: BASIS FOR SANITARY FLOW AND WATER DEMAND ESTIMATES

Calculations explaining basis for the sanitary flow and water demand are included in this report.

Comment 2: GENERAL SERVICE APPLICATION

Preliminary plans have been submitted for review and comment. Final general service application will be submitted at later date.

Comment 3: WATER AND SEWER CONNECTION

Water and sewer connection will be constructed per latest requirements, dated April 1993.

Comment 4: SEPARATE SANITARY AND STORM DRAINS

Separate sanitary and storm drain will be provided, as outlined in Section 13 of the DPIR.

Comment 5: OIL SEPARATOR

On 12-10-92 Cannon did contact by telephone, BSWC (Mr. Eugene Favret) and received latest directions for installation of oil interceptors. Oil interceptor will be constructed following these instructions and per latest BSWC written requirements (dated April 1993).

Comment 6: GREASE TRAP

On 12-10-92 Cannon did contact by telephone, Mr. Eugene Favret, Supervisor for the Commission's Grease Trap Program, regarding installation of grease traps.

In accordance with the Boston Water and Sewer Commission, Sewer Use Regulations, grease traps will be installed serving the Canteen and Dining Room in this building. Local, point-of-use, grease traps will be installed at the Canteen and at the Dining Room. Single large combined secondary grease trap will be installed outside the building for combined flow from Canteen and Dining Room. Grease trap design will follow latest directives as outlined in BSWC written requirements dated April 1993.

BOSTON UNIVERSITY - SCHOOL OF MANAGEMENT

Response to letter from MWRA (Patricia Heidel) dated 11-20-92 to Secretary Suzan Tierney.

A. Suggested water conservation measures for heating and cooling have been reviewed.

1. USE OF CLOSED-LOOP COOLING SYSTEMS WITH COOLING TOWER

Central cooling plant utilizes two 650 ton water cooled electric centrifugal chillers. Heat rejection is accomplished by matching cross flow evaporative cooling towers. These cooling towers have high efficiency drift eliminators to minimize water loss due to drift.

Maximum make-up water use is 39 GPM at full load operation. Average make-up water consumption is 12 GPM, or less than 1/3 of maximum flow.

Cooling towers specified are designed to minimize waste of water and water use approaches theoretical minimum required for evaporative heat rejection.

Proposed cooling system is the most energy efficient cooling system for this building since it utilizes evaporative cooling as means of heat rejection. Electrical energy consumption with use of air-cooled technologies will be 80% higher.

2. ISOLATED COOLING UNITS

A few small size cooling systems are required in dedicated areas (e.g., Telecommunications Room). These systems are air-cooled, closed-loop and do not use any water.

3. AIR-COOLED TECHNOLOGIES

Air-cooled cooling systems do not use evaporation of water as medium for heat reduction. There is no water consumption with these systems, however, electrical energy consumption is 80 percent higher with air-cooled technologies.

Considering the cost of electricity and the impact electricity generating facilities on the environment, the use of evaporative cooling systems is the preferred choice for this building.

4. CAPTURE AND RE-USE OF STEAM

   Proposed building does not use steam for either heating or cooling.

B. Suggested water conservation measures for sanitary facilities.

1. 0.5 GPM FAUCET AERATORS

   0.5 GPM faucet aerators (flow restrictors) are specified throughout the building as stated in the DPIR.

2. 2.5 GPM SHOWER HEADS

   This building has two showers for janitorial staff. Both will have 2.5 GPM shower heads.

3. 1.6 GALLON PER FLUSH TOILETS

   Water saver toilets using 1.6 gallons per flush will be installed throughout the building.

C. Suggested water conservation measures for landscaping.

1. MINIMIZE LANDSCAPED AREAS

   Landscaped areas are minimal.

2. TIMERS

   Timers will be installed on all irrigation systems.

PAGE NO. ____

BY J.C.C. DATE 1/15/93 PROJECT B.H. / CANNON SHEET NO. 1 OF 4

CKD. BY [illegible] DATE 1/28/93 SUBJECT DRAINAGE CALCULATIONS

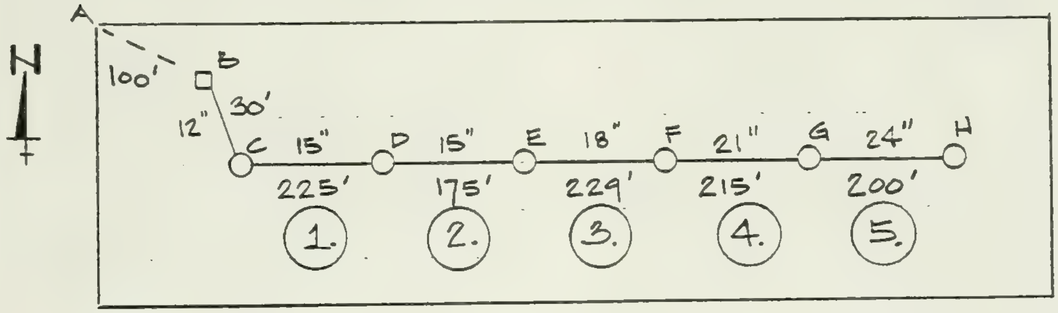
EXISTING STORM RUNOFF CALCULATIONS

USING RATIONAL FORMULA:

$$Q = CIA$$

WHERE $C = 0.90$ (FROM TABLE 10-2.02 F)

- CALCULATE TIME OF CONCENTRATION (T_c)



REACH	DESCRIPTION	SLOPE	LENGTH
A-B	OVERLAND (PAVEMENT)	0.50 %	100'
B-C	COLLECTOR (12")	0.65 %	30'
C-D	STORM DRAIN (15")	0.50 %	225'
D-E	" "	0.46 %	175'
E-F	" (18")	0.61 %	229'
F-G	" (21")	0.50 %	215'
G-H	" (24")	0.50%	200'

COMPUTE TRAVEL TIME FOR EACH SEGMENT:

A-B USING FIGURE 10-2.02 F

$V = 1.5$ FT/S

$T_1 = 100 \text{ FT} \div 1.5 \text{ FT/S} = 67 \text{ sec}$

PAGE NO.

BY JLC DATE 1/15/93 PROJECT B.U. / CANNON SHEET NO. 2 OF 4

CKD. BY DATE 1/28/93 SUBJECT DRAINAGE CALCULATIONS

B-C USING MANNING'S FOR A FULL PIPE ; V = 3.18 FT/sec

T_2 = 30 FT ÷ 3.18 FT/sec = 10 sec

C-D * SEE CAPACITY CALCULATIONS FOR VELOCITIES FROM C TO H.

T_3 = 225 FT ÷ 3.22 FT/s = 70 sec

D-E

T_4 = 175 FT ÷ 3.09 FT/s = 57 sec

E-F

T_5 = 229 FT ÷ 4.07 FT/s = 56 sec

F-G

T_6 = 215 FT ÷ 3.68 FT/s = 58 sec

G-H

T_7 = 200 FT ÷ 4.06 FT/s = 49 sec

TOTAL TIME OF CONCENTRATION (T_c) :

$$T_c = T_1 + T_2 + T_3 + T_4 + T_5 + T_6 + T_7$$

$$= 67 + 10 + 70 + 57 + 56 + 58 + 49$$

$$= 6.1 \text{ MIN}$$

SAY $\boxed{T_c = 5.0 \text{ MIN}}$

BY JCC DATE 1/18/93 PROJECT B.U. / CANNON PAGE NO. SHEET NO. 3 OF 4
CKD. BY YYC DATE 1/28/93 SUBJECT DRAINAGE CALCULATIONS

- CALCULATE PEAK DISCHARGE DELIVERED TO EACH INLET FOR A 10-YR STORM.

USING RATIONAL FORMULA :

$$Q = CIA$$

C = 0.90 (FROM TABLE 10-2.02 E)

I = 5.3 IN/HR (FROM FIGURE 10-2.02 G)

SECTION NO. 1 (15")

$Q = 0.90 \cdot 5.3 \cdot 0.17$ AC

= 0.81 CFS

SAY 1.0 CFS

CAPACITY = 4.0 CFS ∴ 25 % CAPACITY

SECTION NO. 2 (15")

$Q = 0.90 \cdot 5.3 \cdot 0.35$ AC

= 1.67 CFS + 0.81 CFS = 2.48 CFS

SAY 2.5 CFS

CAPACITY = 4.0 CFS ∴ 63% CAPACITY

AMMANN & WHITNEY - CONSULTING ENGINEERS - BOSTON, MA

PAGE NO. ________

BY JCC DATE 1/18/93 PROJECT B.U. / CANNON SHEET NO. 4 OF 4

CKD. BY [illegible] DATE 1/28/93 SUBJECT DRAINAGE CALCULATIONS

SECTION NO. 3 (18")

Q = 0.90 · 5.3 · 0.34 AC

= 1.62 CFS + 2.48 CFS = 4.10

SAY 4.0 CFS

CAPACITY = 7.0 CFS ∴ 57% CAPACITY

SECTION NO. 4 (21")

Q = 0.90 · 5.3 · 1.08

= 5.15 CFS + 4.10 CFS = 9.25 CFS

SAY 9.3 CFS

CAPACITY = 10.0 CFS ∴ 93 % CAPACITY

SECTION NO. 5 (24")

Q = 0.90 · 5.3 · .33

= 1.57 CFS + 9.25 CFS = 10.82 CFS

SAY 11.0 CFS

CAPACITY = 14.0 CFS ∴ 78 % CAPACITY

REFERENCE : MDPW DRAINAGE DESIGN MANUAL
CH. 10 DRAINAGE & EROSION CONTROL
AUGUST 1983

PAGE NO.

BY JCC DATE 1/14/93 PROJECT B.U. / CANNON SHEET NO. 1 OF 3

CKD. BY [illegible] DATE 1/28/93 SUBJECT DRAINAGE CAPACITIES

EXISTING STORM DRAIN CAPACITIES

USING MANNING'S EQUATION :

$$Q = A \cdot V = A \cdot \frac{1.49}{n} \cdot R^{2/3} \cdot S^{1/2}$$

ASSUMPTIONS

SLOPE = 0.005 (FOR PIPE SECTIONS WITHOUT INVERT DATA)

$n = 0.015$

- FOR SECTION NO. 1 (15")

$A = 1.23\ FT^2$

$R = 0.31\ FT$

$$Q = 123\ FT^2 \cdot \frac{1.49}{0.015} \cdot (0.31\ FT)^{2/3} \cdot (0.005\ FT/FT)^{1/2}$$

$$= 1.23\ FT^2 \cdot 3.22\ FT/S$$

$$= 3.96\ CFS$$

SAY $\boxed{Q_1 = 4.0\ CFS}$

REFERENCES :

1. TOPOGRAPHIC SITE PLAN - BOSTON UNIVERSITY
   587-599 COMMONWEALTH AVENUE
   HARRY R. FELDMAN, INC. / 1" = 20'-0" - 1/6/92
2. BWSC WASTEWATER SYSTEM MAP
   SHEET NO. 224 / 1" = 100'-0" — APRIL 1982

PAGE NO.

BY JLL DATE 1/14/93 PROJECT B.H /CANNON SHEET NO. 2 OF 3

CKD. BY JMC DATE 1/28/93 SUBJECT DRAINAGE CAPACITIES

- FOR SECTION NO. 2 (15")

$$\text{SLOPE} = \frac{13.3 - 12.5}{175'} = 0.0046 \text{ FT/FT}$$

$A = 1.23 \text{ FT}^2$

$R = 0.31 \text{ FT}$

$$Q = 1.23 \text{ FT}^2 \cdot \frac{1.49}{0.015} \cdot (0.31 \text{ FT})^{2/3} \cdot (0.0046)^{1/2}$$

$$= 1.23 \text{ FT}^2 \cdot 3.09 \text{ FT/S}$$

$$= 3.80 \text{ CFS}$$

SAY $\boxed{Q_2 = 4.0 \text{ CFS}}$

- FOR SECTION NO. 3 (18")

$$\text{SLOPE} = \frac{12.5 - 11.1}{229'} = 0.0061 \text{ FT/FT}$$

$A = 1.77 \text{ FT}^2$

$R = 0.38 \text{ FT}$

$$Q = 1.77 \text{ FT}^2 \cdot \frac{1.49}{0.015} \cdot (0.38 \text{ FT})^{2/3} \cdot (0.0061)^{1/2}$$

$$= 1.77 \text{ FT}^2 \cdot 4.07 \text{ FT/S}$$

$$= 7.20 \text{ CFS}$$

SAY $\boxed{Q_3 = 7.0 \text{ CFS}}$

PAGE NO. ____

BY JCC DATE 1/14/93 PROJECT B.U. / CANNON SHEET NO. 3 OF 3

CKD. BY DATE 1/28/93 SUBJECT DRAINAGE CAPACITIES

- FOR SECTION No. 4 (21")

$A = 2.41 \text{ FT}^2$

$R = 0.44 \text{ FT}$

$$Q = 2.41 \cdot \frac{1.49}{0.015} \cdot (0.44 \text{ FT})^{2/3} \cdot (0.005)^{1/2}$$

$$= 2.41 \text{ FT}^2 \cdot 4.06 \text{ FT/S}$$

$$= 9.78 \text{ CFS}$$

SAY $\boxed{Q_4 = 10.0 \text{ CFS}}$

- FOR SECTION No. 5 (24")

$A = 3.14 \text{ FT}^2$

$R = 0.50 \text{ FT}$

$$Q = 3.14 \text{ FT}^2 \cdot \frac{1.49}{0.015} \cdot (0.50 \text{ FT})^{2/3} \cdot (0.005)^{1/2}$$

$$= 3.14 \text{ FT}^2 \cdot 4.42 \text{ FT/S}$$

$$= 13.88 \text{ CFS}$$

SAY $\boxed{Q_5 = 14.0 \text{ CFS}}$

AMMANN & WHITNEY - CONSULTING ENGINEERS - BOSTON, MA

PAGE NO. ______

BY JCC DATE 2/25/93 PROJECT CANNON / CIVIL - 1520 SHEET NO. 1 OF 2

CKD. BY DATE 3/1/93 SUBJECT PROPOSED STORM DRAIN CALCULATIONS

PROPOSED STORM DRAINAGE CALCULATIONS

THE PROPOSED STORM DRAIN CONNECTION FROM THE BUILDING WILL DISCHARGE TO EXISTING PIPE SECTION NO. 4 AT MANHOLE F (SEE SHEET NO. 1 OF 4 OF THE DRAINAGE CALCULATIONS). THE EXISTING SITE RUNOFF DISCHARGES TO SECTION NO. 3 & NO. 4. THE FOLLOWING CALCULATIONS WILL REPLACE THE EXISTING SITE CONDITIONS WITH THE PROPOSED CONDITIONS TO DETERMINE THE PROJECT IMPACT:

SECTION NO. 3 (18")

$Q = CIA$; C = RUNOFF COEFFICIENT
I = RAINFALL INTENSITY
A = DRAINAGE AREA

$$= [0.10 \cdot 5.3 \cdot 0.04] + [0.9 \cdot 5.3 \ 0.18] = 0.88 \text{ CFS}$$

$$= \left[0.88 \text{ CFS} + 2.48 \text{ CFS} \left(\substack{\text{FROM}\\ \text{SECTION NO. 2}}\right)\right] = 3.36 \text{ CFS}$$

SAY 3.5 CFS

CAPACITY = 7.0 CFS ∴ 50 % CAPACITY

7 % LESS THAN EXISTING

AMMANN & WHITNEY - CONSULTING ENGINEERS - BOSTON, MA

PAGE NO. ______

BY JCC DATE 2/25/93 PROJECT CANNON / CIVIL -1520 SHEET NO. 2 OF 2

CKD. BY MMC DATE 3/1/93 SUBJECT PROPOSED STORM DRAIN CALCULATIONS

SECTION No. 4 (21")

$Q = [0.90 \cdot 5.3 \cdot 0.37] + 3.5 \text{ CFS}^{*}$

$= [5.26 \text{ CFS} + 3.5 \text{ CFS} \left(\substack{\text{FROM} \\ \text{SECTION No. 3}}\right)]$

$= 8.76 \text{ CFS}$

SAY 8.8 CFS

CAPACITY = 10.0 CFS ∴ 88% CAPACITY

5% LESS THAN EXISTING

SECTION No. 5 (24")

$Q = 0.90 \cdot 5.3 \cdot 0.33$

$= 1.57 \text{ CFS} + 8.76 \left(\substack{\text{FROM} \\ \text{SECTION No. 4}}\right)$

$= 10.33 \text{ CFS}$

SAY 10.5 CFS

CAPACITY = 14.0 CFS ∴ 75% CAPACITY

3% LESS THAN EXISTING

* REFERENCE: CANNON'S MEMORANDUM
DATED 11/20/92
BASED ON MASS PLUMBING CODE 248
CMR AND A.S.P.E.

AMMANN & WHITNEY

179 SOUTH STREET
BOSTON, MASSACHUSETTS 02111
(617) 423-0120
Fax (617) 423-3633

MEMORANDUM

To: William Smith, Cannon

From: David A. Eves

Date: May 19, 1993

Re: Boston University School of Management
Ammann & Whitney Project No. 1520
BWSC's Review of 25 % Site Plan
Meeting Minutes

ttendees: Peter Wong, BWSC/John Cavanaro, A&W

cc: Attendees/R.Rubin, FPA/pf

On April 28, 1993, Ammann & Whitney (A&W) submitted a set of 25% site plans to the Boston Water and Sewer Commission (BWSC) for review and comment. Specifically, A&W requested BWSC to confirm their findings that the existing water and sewer services have adequate capacity to handle the additional demand and discharge from the proposed BU-SMG Project. As a result, a meeting was held at BWSC's 425 Summer Street office on Tuesday May 4, 1993 to discuss BWSC's comments regarding A&W's 25% submission. The following issues were discussed at the meeting:

I. WATER SERVICE

A. Mr. Wong stated that the proposed 4" domestic service will require a 3" meter inside the building. *Neptune Tru/Flow* meters are commonly used by the BWSC, and it was suggested that one may be suitable for this Project.

B. Mr. Wong informed A&W that the proposed 8" fire protection service must include a double duty check valve in compliance with the BWSC's Cross Connection Control Department's (CCCD) standards. The CCCD requires written correspondence requesting approval for the connection.

C. A&W asked BWSC if the results of the Hydrant Flow Test (performed on 9/30/92) proved that there is sufficient capacity in the existing system to handle the additional demand from the Project. Mr. Wong confirmed that the results of the flow test show adequate available capacity for the Project's demand.

II. SANITARY SEWER SERVICE

A. Mr. Wong noted that the proposed 12" connection to the existing 18" sanitary sewer in Commonwealth Avenue should not connect to the nearest existing manhole. Instead, BWSC asked A&W to use a wye branch connection to the existing 18" line.

B. A&W asked BWSC if the calculations submitted with the 25% set of drawings are sufficient to make a determination on whether the existing sanitary sewer has adequate available capacity to handle the additional flows from the Project. Mr. Wong noted that the calculations appear to show adequate capacity for the proposed action, however, BWSC requested that A&W conduct a field inspection of the sewer manholes in Commonwealth Avenue to confirm the actual flow calculations.

III. STORM DRAIN SERVICE

A. Similar to the sanitary sewer service, Mr. Wong noted that a wye branch connection should be used for the proposed storm drain connection rather than connecting to the nearest existing manhole.

B. A&W asked BWSC if the calculations submitted with the 25% set of drawings are sufficient to make a determination on whether the existing storm drain has adequate available capacity to handle to additional flows from the Project. Mr. Wong noted that the calculations appear to show adequate capacity for the proposed action, however BWSC requested that A&W conduct a field inspection of the storm drain manholes in Commonwealth Avenue to confirm the actual flow calculations.

A&W will inform the BWSC regarding the results of any field inspection of the sanitary sewer and storm drain manholes in Commonwealth Avenue.

This is A&W's understanding of the issues discussed at the meeting, if you have any questions, or comments regarding this memorandum, please contact this office.

JCC/jms

AMMANN & WHITNEY
CONSULTING ENGINEERS
179 South Street • Boston, MA 02111 • (617) 423-0120

April 28 , 1993

Boston Water and Sewer Commission
425 Summer Street
Boston, Massachusetts 02210

Attention: Mr. Peter Wong

Reference: Boston University/School of Management
595 Commonwealth Avenue, Boston, MA 02215
25% Submittal Review

Dear Mr. Wong:

Ammann & Whitney is preparing the infrastructure design for Boston University's proposed School of Management building at 595 Commonwealth Avenue as a subconsultant to Cannon. A major component of the infrastructure is the water and sewer service to the site. We have submitted a set of 25% complete site plans with the appropriate calculations for the water and sewer service to the site for your preliminary review.

As you are aware, it has been requested that the project submit an Environmental Impact Report (EIR) to the Boston Redevelopment Authority (BRA) prior to designing the project to 100% complete. As a result, we request that the BWSC confirm that the existing water and sewer system has adequate capacity to handle the proposed demand and discharge from the new 10 story building.

At this time, the exact invert elevations of the proposed connections is unknown, therefore, they are not shown on our drawings. Our intent is to allow the Commission to review our 25% Submittal, and verify whether or not the existing system is adequate to handle the proposed action. Once we have reached a conclusion with the Commission regarding impact to the existing system, we will proceed with our design.

If you have any questions or comments regarding this submittal, please contact this office as soon as possible. Thank you for your assistance.

Very truly yours,

Peter E. Murphy

Peter E. Murphy
Principal

JCC/

cc: DAE

AMMANN & WHITNEY CONSULTING ENGINEERS

179 SOUTH STREET • BOSTON MASSACHUSETTS, 02111 • (617) 423-0120

FAX NUMBER: (617) 423-3633

TELEPHONE MEMORANDUM

From: JOHN CAVANARO
To: PAUL HEALY, SEWER OPERATION
Company: A & W
Company: BWSC
Phone No: 423-0120
Phone No: 330-9400 X 555
PROJECT NAME/NO: 1520
DATE: 5/7/93
TIME: 1:30 P.M

I CALLED PAUL TO FOLLOW UP ON A REQUEST I MADE TO JOE BEAUDETTE THIS MORNING REGARING SEWER OPERATIONS OVER THE PAST TWO YEARS IN COMM AVE (OUTBOUND) BETWEEN DEERFIELD ST. & SHERBORN ST.

PAUL INFORMED ME THAT THE BWSC HAS NO RECORD OF ANY PROBLEMS WITH SEWER OPERATIONS (SANITARY & STORM) IN THE AREA DESCRIBED. The ONLY ACTIVITY IN THE AREA HAS BEEN REGULAR MAINTENANCE (I.E. CLEANING CATCH BASINS).

c: P/F

SIGNED: John Cavanaro

AMMANN & WHITNEY

TELEPHONE MEMORANDUM

CALL (From JOHN CAVANARO
(Company A & W
(Phone No. 423-0120
PROJECT NAME/NO. CANNON /UNIL
1520

(To PETER WONG
(Company BWSC
(Phone No. 330-9400 X 420
DATE 4/27/93 TIME 11 00 A.M

I CALLED PETER TO INFORM HIM THAT WE NEED THE BWSC TO CONFIRM THAT THE EXISTING WATER & SEWER SYSTEM HAS ADEQUATE CAPACITY TO HANDLE THE DEMAND & DISCHARGE FROM THE PROPOSED 10 STORY BUILDING. I ASKED PETER IF IT WAS NECESSARY TO CONDUCT A FLOW TEST OF THE SANITARY & STORM SEWERS TO MEASURE THE EXISTING FLOWS. PETER INFORMED ME THAT IT IS NOT COMMON FOR STORM & SANITARY SEWERS TO BE FLOW TESTED, NOR DOES THE BWSC CONDUCT FLOW TESTING FOR PRIVATE CONSULTANTS, HOWEVER, IT CAN BE DO

I REQUESTED THAT THE BWSC REVIEW OUR 25% SUBMITTAL & CONFIRM OUR FINDINGS THAT THE SYSTEM IS ADEQUATE FOR ADDITIONAL FLOWS. PETER SUGGESTED THAT WE SUBMIT OUR DRAWINGS & CALCULATIONS FOR THEM TO COMMENT ON.

AMMANN & WHITNEY

TELEPHONE MEMORANDUM

ALL (From JOE McEACHERN (To JOHN CAVANARO

(Company BOSTON WATER & SEWER (Company AMMANN & WHITNEY

(Phone No. 330-9400 X-420 (Phone No. 422-0120

ROJECT NAME/NO. CANNON / CIVIL #1520 DATE 1/21/93 TIME 3:00 P

JOE McEACHERN, ENGINEERING SERVICES, CALLED TO NOTIFY ME OF THE STATUS WITH THE STORM DRAIN LINE IN THE NORTH SIDE OF COMMONWEALTH AVENUE BETWEEN SHERBORN ST & DEERFIELD ST. JOE INFORMED ME THAT THE COMMONWEALTH OF MASS., UNDER CONTRACT "CHAPTER 90" FOR THE MBTA, TRANSFERRED OWERSHIP OF THE DRAIN LINE MARKED "MBTA" TO THE BWSC. THE BWSC CLAIMS THAT THEY SERVICE THE LINE AND BELIEVE THAT IT DISCHARGES TO THE MUDDY RIVER CONDUIT. JOE PLANS TO CONDUCT FURTHER RESEARCH TO LOCATE ANY PLANS ASSOCIATED WITH THE 'CHAPTER 90' CONTRACT AND INFORM ME ABOUT THE RESULTS OF HIS RESEARCH.

FOLLOW UP: (1/25/93) JC I VISITED THE BWSC OFFICES & OBTAINED ADDITIONAL DATA REGARDING THE STORM DRAIN & SANITARY SEWER. ALSO, I DISCUSSED THE INTENT OF THE PROJECT WITH PETER WONG. PETER SUGGESTED THAT THE PROPOSED ACTION APPEARED SUITABLE FOR THE PROJECT DEMAND'S.

DAE MMc F/E John Cavanaro

AMMANN & WHITNEY

TELEPHONE MEMORANDUM

CALL (From ART HARDIGAN (To JOHN CAVANARO
(Company B.U./TEL. COMM DIVISION (Company A&W
(Phone No. 353-2097 (Phone No. 423-0120
PROJECT NAME/NO. 1520 DATE 1/13/92 TIME 4^{00} P.M

ART HARDIGAN CALLED TO INFORM ME THAT HE HAS NON-REPRODUCIBLE PRINTS OF NET CONSTRUCTION PLANS FOR THE (SHERBORN-DEERFIELD PRIVATE ALLEY #912. HE STATED THAT HE IS AWARE OF THE WORK IN THE ALLEY WHICH IS BEING DONE FOR THE PROPOSED SOM BLDG. I CONFIRMED WITH ART THAT THE PLANS IN HIS POSSESION ARE IDENTICAL TO THE PLANS I TRACED AT NET THIS AFTERNOON, THEREFORE I DON'T NEED THEM

ART WILL NOTIFY ME, IF HE DISCOVERS ANY ADDITIONAL INFORMATION FOR THE PROJECT AREA, AND HE WILL SEND ME A COPY OF THE AS-BUILT DRAWINGS FROM THE NEW CONDUIT INSTALLATION AS SOON AS THEY'RE AVAILABLE (APPROX. 1 MONTH).

DATE

John Cavanaro

AMMANN & WHITNEY

TELEPHONE MEMORANDUM

CALL (From DON MELLO

(Company MWRA

(Phone No. 242-7310

PROJECT NAME/NO. CANNON / CIVIL

(To JOHN CAVANARO

(Company A&W

(Phone No. 423-0120

DATE 12/30/92 TIME 11:15 A

MR. MELLO ACKNOWLEDGED THE RECEIPT OF MY TELEFAX MEMORANDUM. HE INFORMED ME THAT THE MWRA DOES NOT OWN OR OPERATE ANY SEWER LINES IN THE PROJECT AREA OF THE PROPOSED B.U. BUILDING (595 COMM AVE - BETWEEN SHERBORN ST & DEERFIELD ST).

I ASKED MR. MELLO IF HE WAS AWARE OF ANY WATER LINES IN THE PROJECT AREA THAT ARE OWNED/OPERATED BY THE MWRA. HE SUGGESTED THAT I SEND A SIMILAR TELEFAX TO JAMES GILLIS, WHO WOULD BE ABLE TO INFORM ME ABOUT THE STATUS OF MWRA WATER LINES IN THE PROJECT AREA.

John Cavanaro

c: DAE

AMMANN & WHITNEY

TELEPHONE MEMORANDUM

ALL (From TOM HORAN
(Company BOSTON EDISON CO.
(Phone No. 424 - 2281
ROJECT NAME/NO. CANNON / CIVIL
1520

(To JOHN CAVANARO
(Company AMMANN & WHITNEY
(Phone No. 423 - 0120
DATE 1/20/93 TIME 2:30 P

TOM CALLED TO INFORM ME THAT HE RECEIVED THE PRELIMINARY DESIGN LETTER FROM CANNON DATED 12/5/91 AND THE SKETCH OF THE PROPOSED CONNECTION THAT I SENT TO HIM. HE REQUESTED THAT I SEND HIM ANY ADDITIONAL INFORMATION REGARDING THE PROPOSED LOAD BREAKDOWN AND ANY PLANS OF THE PROPOSED ELECTRICAL WORK.

AFTER REVIEWING THE INFORMATION THUS FAR, TOM FORSEES NO POTENTIAL PROBLEM WITH BOSTON EDISON PROVIDIN SERVICE TO THE PROPOSED SITE.

AMMANN & WHITNEY · CONSULTING ENGINEERS · BOSTON, MA

PAGE NO. ____

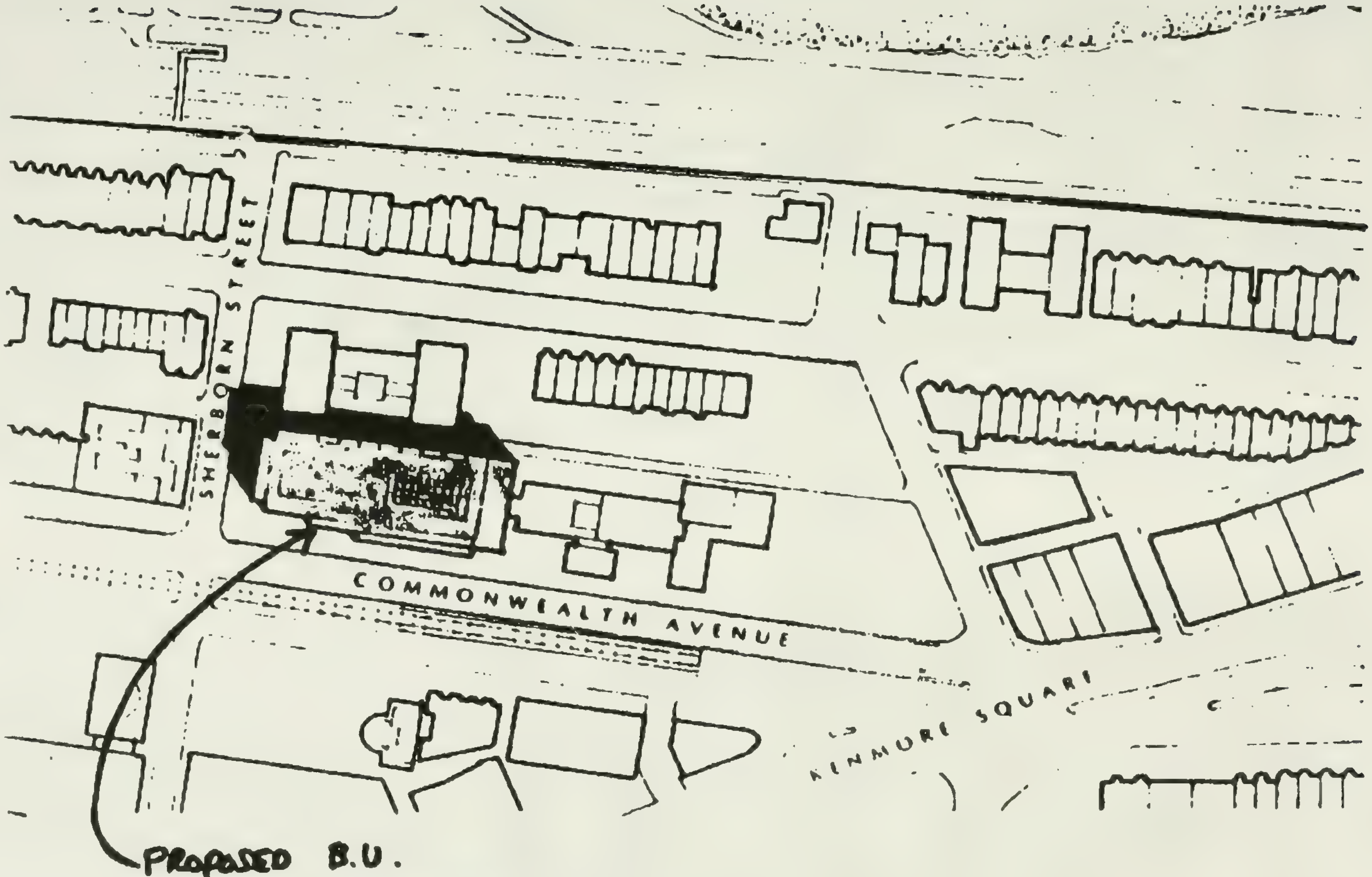
BY JCC DATE 1/18/93 PROJECT B.U. / CANNON -1520 SHEET NO. 1 OF 2

CKD. BY ___ DATE ______ SUBJECT DPIR TASK

UTILITY SERVICE / AGENCY	COORDINATION DOCUMENTS	CONTACT / PHONE NO.
ELECTRICAL / BOSTON EDISON CO.	• NOTIFICATION LETTER FROM CANNON, TO BECO DATED 12/5/91	GEORGE CROVO / 424 - 2000
WATER / MWRA	• DATA REQUEST FOR PROJECT AREA DATED 12/30/92 INCLUDING A RESPONSE STATING "...NO FACILITIES IN SUBJECT AREA." DATED 1/4/93	JAMES GILLIS / 242 - 7110
SEWER / MWRA	• TELEPHONE MEMORANDUM STATING NO MWRA SEWER FACILITIES WITHIN PROJECT LIMITS DATED 12/30/92	DON MELLO / 242 - 7310
TELEPHONE / NEW ENGLAND TEL.	• MEMORANDUM FROM TERRENCE RICHARDSON ACKNOWLEDGING NEW CONDUITS IN PLACE FOR THE PROPOSED BLDG. DATED 1/12/93	LILLA KENYON / 743 - 4405
TELE COMM / BOSTON UNIVERSITY	• TELEPHONE MEMO STATING WORK IN PLACE FOR NEW BLDG.	ART HARDIGAN / 353 - 2097

PAGE NO. ____
BY JCC DATE 1/18/93 PROJECT B.U./CANNON - 1520 SHEET NO. 2 OF 2
CKD. BY ____ DATE ____ SUBJECT ____

UTILITY SERVICE / AGENCY	COORDINATION DOCUMENTS	CONTACT / PHONE NO.
WATER & SEWER / BWSC	• FLOW TEST RESULTS FROM HYDRANT NO. 88-M22H DATED 9/30/92 • LETTER FROM CANNON FOLLOWING A MEETING WITH PETER WONG NOTING ADEQUACY OF EXISTING SERVICES TO HANDLE ADDITIONAL SERVICES.	PETER WONG / 330-9400
GAS / BOSTON GAS CO.	o EXPECTING LETTER FROM BGC CONFIRMING APPROVAL OF TIE-IN TO EXISTING 24" MAIN IN COMMONWEALTH AVE.	BOB STEELE / 323-9210



PROPOSED B.U.
SCHOOL OF MANAGEMENT
BUILDING

LOCUS PLAN

12/19/1991

Boston Water and
Sewer Commission

425 Summer Street
Boston, MA 02210-1700
617-330-9400
Fax 617-330-5167

October 6, 1992

RECEIVED
CANNON

OCT 7 1992

Proj. No. 836.00
File Category 3.0
cc. B.Sm

Mr. Michael L. Vaccaro
Mechanical Engineer
Cannon
148 State Street
Boston, MA 02109

Re: Hydrant Flow Test,
Commonwealth Ave. near Sherborn Street, Boston
Cannon Project No. 836.00

Dear Mr. Vaccaro:

As per your request, we conducted a hydrant flow test at Sherborn Street at Commonwealth Avenue, Boston on September 30, 1992. The results are as follows:

Static	62.0	psi
Residual	51.0	psi
Flow	3,399	gpm
Estimated quantity available @ 20 psi	7,007	gpm

I trust that this information is what you require. If I can be of further assistance, please feel free to call me.

Yours truly,

John P. Sullivan, Jr., P.E.
Chief Engineer

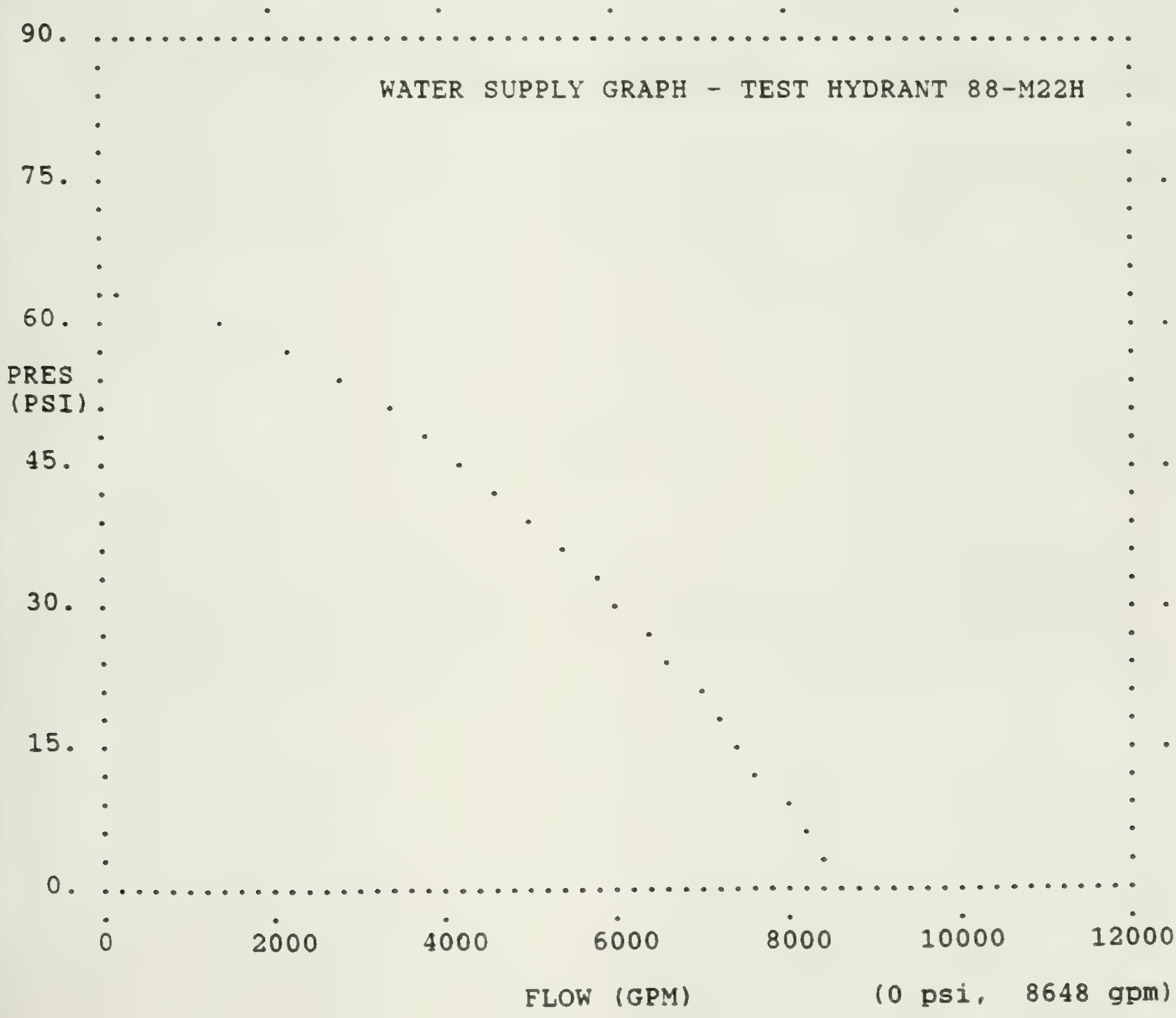
JPS/AC/mo

HYDRANT FLOW TEST REPORT

Test Hydrant: 88-M22H Date: 9/30/1992 Time: 10:15 FRESH
Location:
Sherborne Street @ Commonwealth Avenue
Elevation: 16 ft Tester: Anne Lamb
Remarks:
Test conducted on a southern low 16" water main laid in 1893.
Gage: S-2 Static Pressure: 62.0 psi Residual Pressure: 51.0 psi

FLOW HYDRANT	GAGE	DIAMETER	COEFFICIENT	PITOT	FLOW
new	1	2- 8/16 in	0.850	42.0 psi	1027 gpm
new	1	2- 8/16 in	0.850	42.0 psi	1027 gpm
18	2	2- 8/16 in	0.850	18.0 psi	672 gpm
18	2	2- 8/16 in	0.850	18.0 psi	672 gpm

Total Flow: 3399 gpm
Flow @20 psi: 7007 gpm Flow @10 psi: 7863 gpm



Planning
Architecture
Engineering
Project Delivery

[illegible] State Street
Boston, MA 02109
617-742-5440

August 14, 1992

Mr. Peter Wong
Boston Water and Sewer Department
425 Summer Street
Boston, MA 02210

Re: Boston University School of Management
Project No. 0836.00

Dear Peter:

Thank you for meeting with me on August 3, 1992 to review the preliminary water, sanitary and storm services for the above referenced project. It is our understanding that the utility services at Commonwealth Avenue are adequate for this project.

The Contract Document Site Utility Plan, detailing final utility connections and all engineering calculations in tabulated form per your department requirements will be submitted to you for your review.

We will contact you shortly to make arrangements for a new water flow test on Commonwealth Avenue near Sherborn Street for this project.

Thank you for your assistance.

Sincerely,

Michael Vaccaro

Michael L Vaccaro
Mechanical Engineer

MV/elc

cc: Jan Gleysteen
Frank Smaak

Boston Buffalo Grand Island New York St. Louis Washington

CANNON

December 5, 1991

Boston Edison Company
Energy Management and Marketing Department
800 Boylston Street
Boston, MA 02199

Attention: Mr. David E. Whittaker
Senior Load Management Representative

Re: Boston University
School of Management
Cannon Project No. 00836.00

Dear Mr. Whittaker:

We wish to make official notification to Boston Edison Company that Boston University is embarking on a construction program with Cannon as their architectural/engineering consultant. Although we are in the early stages of project design, some preliminary engineering decisions have been made. We hope that this letter will identify the scope of the project and establish the design criteria we will be working toward in relation to your electrical services. We also hope to gain some information in regard to services and programs available by your offices in regards to energy efficiency and energy efficiency lending/rebates.

The project will consist of approximately 500,000 square feet at 595 Commonwealth Avenue at the corner of Sherborn Street. The School of Management building will consist of a 14 story structure outlined as follows:

Floors	Usage	Total Square Feet
3 floors below grade	Parking levels	130,000
1 - 6	School of Management	222,000
7 - 10	University Administration	108,000
Mechanical Penthouse		40,000

A total of six (6) elevators estimated at 75 hp each and one (1) 150 hp fire pump is anticipated. Our preliminary load analysis indicates that 3,850 KW total connected load is anticipated for the project. Mechanical systems motor load would encompass approximately 1,600 KW of this load including a 1,000 ton chiller.

Please review your service requirements in relation to this project. We request that you provide specific information in regards to:

1. Alternative locations for medium and low voltage service entrances to the building.
2. Quantity of services available and the reliability of each service. (We currently are anticipating two (2) medium voltage services to the building at 15 KV).
3. Utility rate schedules available for this customer at both the medium and low voltage levels.
4. Scoping of utility versus contractor work at both the medium and low voltage levels.
5. Estimated Boston Edison initial costs at both the medium and low voltage levels.
6. Suggested energy efficiency measures and incentive programs you may offer so that our client may gain an opportunity to go to more efficient systems.
7. Other service information you feel pertinent at this time.

Be advised that we anticipate a fall 1992 construction start for this project.

We have included a preliminary copy of the site plan for your use.

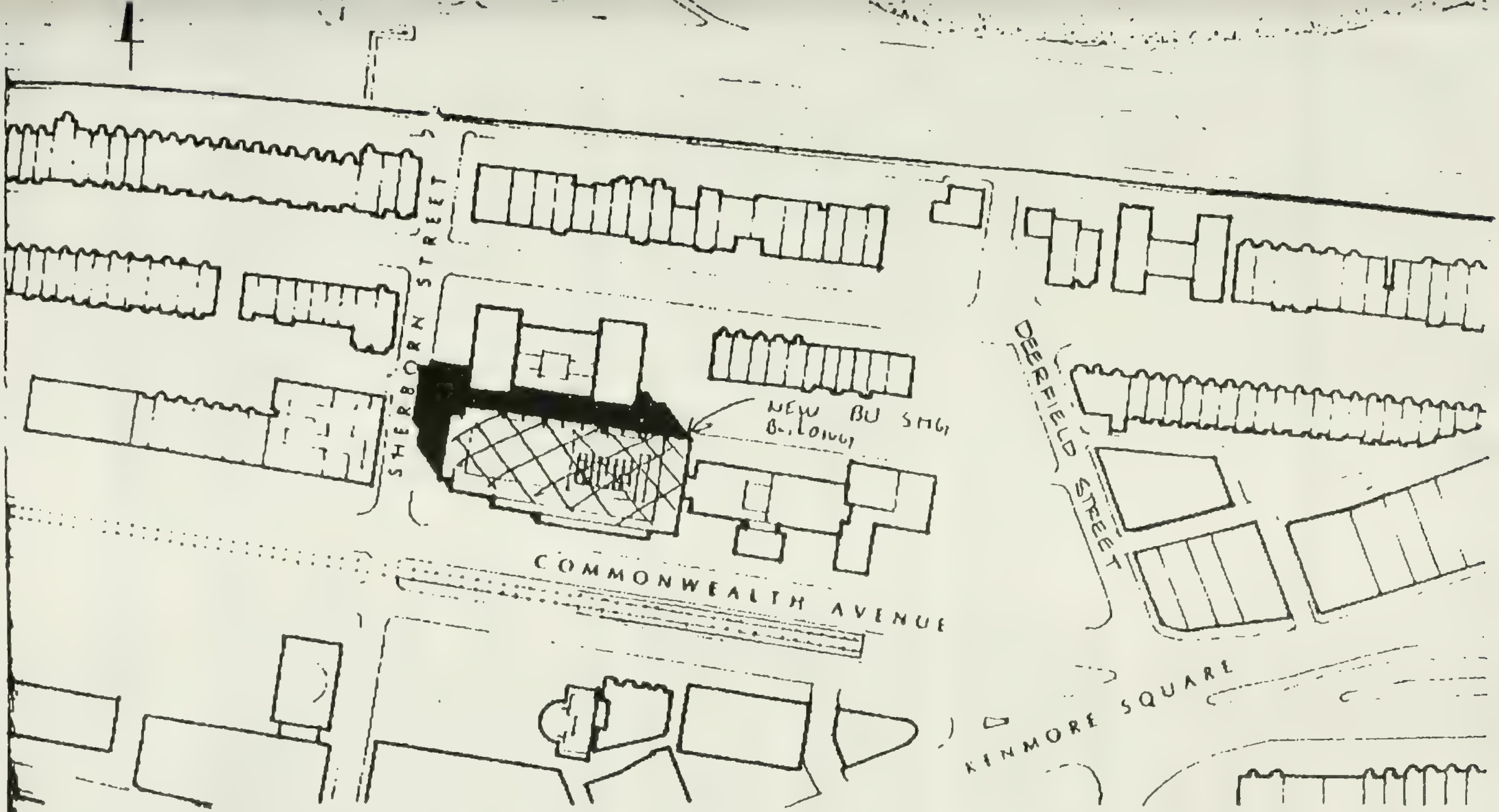
We look forward to working with you and your staff on the project and hope that the above information is satisfactory for your current needs. Should you have any questions or require any additional information, please do not hesitate to contact me at (716) 858-3485. My business card is included for your convenience.

Very truly yours,

[redacted]
Vice President - Engineering

TGF/ht
Enc.

cc: Ray Borst



LOCUS PLAN

Canned
12-5-91

AMMANN & WHITNEY
CONSULTING ENGINEERS
179 South Street • Boston, MA 02111 • (617) 423-0120

RECEIVED
- 5 1993
AMMANN & WHITNEY
BOSTON, MA

December 30, 1992

District Engineer
Massachusetts Water Resources Authority
Water Division
Charlestown Navy Yard
100 First Avenue
Boston, MA 02129

Attention: Mr. James Gillis

Reference: Boston University/School of Management
595 Commonwealth Avenue, Boston, MA 02215
UTILITY COORDINATION

Ammann & Whitney is currently involved in the design of a proposed building on Commonwealth Avenue to be occupied by the Boston University School of Management. Our work includes the design and/or coordination of service connections from the proposed building to the respective utility line/structure.

We request that your company provide plans and information of your facilities relative to the effective area (see attachment). Ammann & Whitney would appreciate your company submitting the necessary information to this office. Please bill this office for any necessary payment for the requested plans.

If there are any questions regarding this matter, please contact Mr. John Cavanaro of this office.

Very truly yours,

Ammann & Whitney

Peter E. Murphy
Principal

January 4, 1992

JEC/

MWRA Waterworks Division maintains no facilities within subject area.

Rajesh Shah, Technical Asst.

for James L. Gillis
Director, Metropolitan Operations

Attachment

cc: DAE

Bostongas

FOR THESE TIMES IT'S A NATURAL

MARKETING DEPARTMENT

BOSTON GAS COMPANY
201 Rivermoor Street
Boston, MA 02132

Telephone (617) 323-9210
Fax (617) 469-2248

Fax Cover Sheet

Date: 1-20-93

To: JOHN CAVANARO
AMMANN & WHITNEY

From: BOB STEELE

Total pages including cover sheet: 4

Originator comments:

RECEIVED
JAN 20 1993
AMMANN & WHITNEY
BOSTON, MA

WE DIDN'T DESIGN OUR PRODUCT TO BE BETTER FOR THE ENVIRONMENT.

NATURE DID.

Bostongas

Boston Gas Company
201 Rivermoor Street
Boston, Massachusetts 02132
Telephone (617) 323-9210

Cannon Engineering
2170 Whitehaven Road
Grand Island, NY 14072
Attn: Frank Smaak

January 14, 1993

Dear Frank:

To confirm our conversation, regarding the B.U. School of Management Building, gas is available per the following:

LOADS

Space Heat - 15,000 cfh
Domestic Hot Water/Misc. - 2,500 cfh

SERVICE LINE

A 6" gas line including meter, be brought in to the parking garage (served from 24" cast iron main in Commonwealth Ave.)

PRESSURE

The company will supply a pressure of no more than 4 inches water column, measured at the outlet side of the meter.

COST

The cost to Boston University for the gas line and meter, including all excavation, well be $17,074 per the Sales Agreement. If gas air conditioning is installed and/or a commitment to use a minimum "threshold" on the dual/fuel heating boilers, this cost will be negotiable.

If you have any questions or concerns, please feel free to call me anytime at (617) 323-9210 X631.

Sincerely,

R. Steele

Robert J. Steele
Key Account Representative
Marketing

Bostongas

Boston Gas Company
201 Rivermoor Street
Boston, Massachusetts 02132
Telephone (617) 323-9210

Cannon Engineering
2170 Whitehaven Road
Grand Island, NY 14072
Attn: Mr. Frank Smaak

SALES AGREEMENT - FIELD MARKETING DEPARTMENT

JOB # 313369

This Agreement, made this 15th day of January, 1993, by and between Boston Gas Company (hereinafter called "Company"), and Boston University (hereinafter called "Applicant"), hereby agree as follows:

1. SCOPE OF AGREEMENT

The Company shall sell and deliver, and the Applicant shall purchase and accept, natural gas at the following point(s) of delivery and for the volumes and uses as indicated:

Location	Equipment	MBTU/Hr.
585-595 Commonwealth Ave.	Heating	17,500
Boston, MA 02215	Water Heating	

2. CONDITIONS AND PRICE

The natural gas sold pursuant to this Agreement will be billed to the Applicant by the Company according to rate classification No. 44 on file with the Massachusetts Department of Public Utilities and is subject to the Company's Terms and Conditions of gas service and the provisions of the Company's Price Adjustment Clause as each or several are amended from time to time. The Applicant shall pay $ 17,074.00 for the installation work to the Company upon execution of this Agreement.

Any installation cost quoted by a Marketing Representative is subject to review by the Company's Engineering Department. Should that review include costs or terms inconsistent with the quoted cost, either the Company or the Applicant may cancel this agreement. Upon such cancellation by either party, all monies submitted to the Company as payment for installation of service will be promptly refunded to the Applicant. The above-stated cost is subject to weather conditions and all federal, state and local codes and permits.

3. GAS SERVICE LINES AND METERING

The Company shall set meter(s) or regulators on gas lines, within twelve (12) feet of point of entry on unconcealed piping on existing services, in accordance with Company specifications. Gas meter(s) will be installed outside on all new services. The Applicant/Owner(s) grants the Company the right to enter on the premises to install, inspect, maintain, and remove gas lines, meters, regulators and other appurtenances and, upon request, will grant the Company an easement to that effect. The Applicant/Owner will be responsible for protecting all metering equipment and allowing access by the Company.

4. APPROVALS

The Company agrees to petition for all necessary approvals and permits from the appropriate authorities for the installation of gas service lines. In the event that these approvals are not obtained within a reasonable time, the Company may terminate this Agreement and return to the Applicant all unexpended monies paid by the Applicant.

5. APPLICANT'S EQUIPMENT AND INSTALLATION

All gas using equipment shall be approved by the American Gas Association and/or the appropriate testing laboratory and shall be installed by the Applicant in accordance with all state and local codes, as well as in accordance with the Company's and the equipment manufacturer's specifications. If gas is used for heating, it must be the primary fuel.

6. GAS DELIVERY PRESSURE

The Company will supply a pressure of no more than four (4) inches water column, measured at the outlet side of the meter. Exceptions to this requirement must be approved in writing by the Company and must conform with all state and municipal regulations.

7. CONDITIONS OF AGREEMENT

This Agreement shall become effective after the Applicant has:

(a) Signed and returned both copies of the Sales Agreement, along with a check for installation work in the amount of $ 17,074.00 payable to Boston Gas Company, by February 5, 1993 to Robert Steele, 201 Rivermoor St., W. Roxbury, MA 02132; and

(b) Received the approval of the Company's Credit Department and paid a gas bill security deposit of $ -0- by SEPARATE CHECK

BOSTON GAS COMPANY

By: ______________________
(Signature)

Robert Steele
(Type above name)

Date: ______________________

APPLICANT

By: ______________________
(Signature)

____
(Print or type above)
Name or title

Date: ______________________

RECEIVED
15 1993
AMMANN & WHITNEY
BOSTON, MA

New England Telephone
A NYNEX Company
1070 Hancock Street
Floor 4
Quincy, Massachusetts 02169
Phone (617) 847-9066

Subject: Utility Co-ordination For B.U. School of Management 595 Commonwealth Avenue proposed building.

Date: January 12, 1993

To: Ammann & Whitney
Consulting Engineers
ATTN: John Cavanaro

From: Terrence Richardson
Loop Technology Planner
New England Telephone

New England Telephone does not provide plans for underground conduit locations. Your engineer can trace original plats at 425 Summer Street on the 6th Floor of our Boston Office.

The Boston Office has worked with Art Hartigan of Boston University to design a new conduit system which was placed to the property line of this proposed building.

I have sent you reduced & cut up conduit schematics to be used as a guide which will show you we have conduit on all 4 streets around the proposed construction.

If you need further information from our Boston Office as to location of proposed underground conduit to new building, contact Lilla Kenyon on (617) 743-4405.

If you require further information, I can be reached on (617) 847-9057.

Terrence Richardson
Terrence Richardson
Loop Technology Planner
New England Telephone

cc: T. McHugh
J. Ross
G. Corcoran
L. Kenyon

CANNON

December 19, 1991

Boston Gas Marketing Department
201 Rivermore Street
Boston, MA 02132

Attention: Mr. Bob Steel

Re: Boston University
School of Management
Project No. 00836.00

Dear Mr. Steel:

Pursuant to our telephone conversation of 12/19/91, please find below anticipated connected gas load for subject building.

•	Space Heating:	15,000 CFH
•	Domestic Hot Water Htg./Misc. Loads:	2,500 CFH
	TOTAL	17,500 CFH

We anticipate the gas service to enter the building from Commonwealth Avenue. A reference plan indicating location of the building is included for your use.

Please call should you have a question.

Sincerely,

Frank Smaak
Associate
Project Mechanical Engineer

/cac

c: Ray Borst

Enclosure

Appendix D Transportation

Vanasse Hangen Brustlin, Inc.

Engineers,
Planners,
and
Scientists

VHB

101 Walnut Street
Post Office Box 9151
Watertown
Massachusetts 02272
617 924 1770
FAX 617 924 2286

December 1, 1992

Ref: 3244

Mr. Andrew McClurg
Boston Transportation Department
Room 721
One City Hall Square
Boston, MA 02201

Re: Boston University Proposed School of Management (SMG)
595 Commonwealth Avenue, Boston

Dear Andy:

Vanasse Hangen Brustlin, Inc. has reviewed the draft Access Plan Scope for the School of Management project, which was attached to the Scoping Determination from the Boston Redevelopment Authority dated October 27, 1992. Because of that review, we would like to suggest some minor modifications and clarifications. As you know, Boston University's proposed development will result in a project of 360,000 square feet and 270 parking spaces. The parking component will add 89 spaces to the existing parking supply on the site (the University-owned Lahey and Granby parking lots). The University has explained that this project is a consolidation and upgrade of its facilities with no appreciable increase in students or employees anticipated. In addition, the transportation analysis VHB completed for the Project Notification Form (PNF) concluded that:

> "the project is anticipated to add a total of 228 daily vehicle trips to the project site, a negligible increase. Since most of the vehicle trips are already occurring on the streets surrounding adjacent portions of the University campus, only a small number of trips will be added overall. Therefore, the level of traffic impact of the proposed development will be negligible." [PNF Chapter 6, Transportation, August 25, 1992.]

In addition to the project's small anticipated impacts, there has been an extensive transportation analysis already conducted as part of the 899-925 Commonwealth Avenue review process, which was completed in 1990. The following are our suggested modifications and clarifications to the draft Access Plan scope.

Study Area

We suggest confining the traffic analysis to the intersection of Commonwealth Avenue, Sherborn Street, and Blandford Street for existing and future conditions and the proposed site driveway intersection with Commonwealth Avenue for the future condition. We suggest eliminating the Kenmore Square intersection since the project would add virtually no peak-hour traffic to this location.

1.1 Traffic

We suggest confining our analysis to morning and evening peak hour conditions and eliminating the analysis of weekend conditions since the latter would not be appreciably affected by the proposed project.

1.2 Parking

The parking supply available to serve the Boston University campus is well-documented in the Boston University Campus Parking Study, completed in 1986. To limit the amount of information repeated in this PIR, we suggest that the area for evaluation of on-street parking be bounded by Deerfield Street, Bay State Road, Granby Street, and Cummington Street since all are street segments that fall within two blocks of the site.

1.3 Transit

For transit information, we would like to present the MBTA bus and rapid transit routes that are in the vicinity of the project site and indicate the scheduled service during the morning, mid-day, and evening peak periods. We do not intend to collect any new data on ridership.

1.4 Pedestrians

We propose to use any existing available pedestrian information for the major corridors and will conduct a count of Commonwealth Avenue and Sherborn Street on the north side of the intersection, as requested. The south side of the intersection (Blandford Street) will also be counted. We will also summarize the results of the Boston University Pedestrian Study, completed in April 1992.

2.1 Trip Generation

Our approach to determining the project's person-trip generation characteristics was outlined in the PNF. We propose to use the same approach and request your agreement.

2.4.3 and 2.4.4 Future Transit and Pedestrian Impacts

Because the project is not anticipated to add new transit riders or increase overall pedestrian volumes on the campus, we propose to conduct only a qualitative evaluation of these impacts.

2.5.4 Parking

We propose to prepare a plan of the layout, access, and space dimensions for the proposed parking garage that is part of the development, but not for the remainder of the University campus.

4 Mitigation

We do not anticipate that the project will require major new mitigation measures beyond those already underway at the University's Charles River campus. We will describe the actions currently underway at the University and will also define new actions proposed as a result of the project.

The other items in the draft scope not addressed above will be analyzed and presented in the Access Plan as indicated in the Scope. We would be happy to meet with you to discuss these proposed modifications further. Please feel free to contact me or Ray Niedowski with any questions.

Very truly yours,

VANASSE HANGEN BRUSTLIN, INC.

Bill

William L. Schwartz, AICP
Project Manager

xc: R. Niedowski-VHB
D. Bohn-VHB
R. Rubin-Fort Point Associates
P. Rinaldi-Boston University

TRAFFIC OPERATIONS
ANALYSIS CALCULATION SHEETS

```
CINCH PROGRAM VERSION DATE 4-29-1988
1985 HCM - CHAPTER 9: SIGNALIZED - OPERATIONAL ANALYSIS
BU SCHOOL MGMT
COMM AVE/SHERBORN/BLANFORD EXISTING AM
date:01-28-1993             time:14:52:22
LAST DATA SET NAMES LOADED OR SAVED
VOLUME=cosbexam   GEOMETRICS=COSBEXAM   SIGNAL=COSBEXAM
LOCATED IN CBD:N
VOLUME & GEOMETRICS
        VOLUMES      # OF LANES     LANE WIDTH     CROSS
DIR  LT   TH   RT    LT TH RT      LT   TH   RT    WALK
EB    0  849   43     0  2  0     0.0 12.0  0.0     40
WB   21  495   72     1  2  0    12.0 12.0  0.0     40
NB    0    5    0     0  1  0     0.0 12.0  0.0     40
SB   28   31   36     0  1  0     0.0 12.0  0.0     40

TRAFFIC & ROADWAY CONDITIONS
                 ADJ PARK              PEDESTRIANS        ARR
DIR GRADE %HV   Y/N MOVES BUSES  PHF CROSS BUT MIN TIME TYPE
EB  0.0%  1.0%   Y    10     0   .850  132   Y    17.0    3
WB  0.0%  1.0%   Y     8     0   .940   32   Y    17.0    3
NB  0.0%  0.0%   Y     4     0   %1.000   74   Y    17.0    3
SB  0.0%  0.0%   Y     4     0   .820  210   Y    17.0    3

PHASINGS
    EASTBOUND   WESTBOUND   NORTHBOUND  SOUTHBOUND GREEN  Y+R PRE/ACT
     l  t  r  p  l  t  r  p  l  t  r  p  l  t  r  p
 1      *  *        *  *                            56.0   3    A
 2                           *  *  *     *  *  *    20.0   3    A
 3               *  *  *                            15.0   3    A

CYCLE= 100.0

VOLUME ADJUSTMENT WORKSHEET
PART 1 (MOVEMENT ADJUSTMENTS)
DIR  LTV  THV  RTV   PHF  LTFR THFR RTFR
EB     0  849   43  .850     0  999   51
WB    21  495   72  .940    22  527   77
NB     0    5    0  %1.000     0    5    0
SB    28   31   36  .820    34   38   44

PART 2 (LANE GROUP ADJUSTMENTS)
DIR LN GROUP  FLOW N   LU     v  Plt  Prt
EB  TH-RT     1049 2 1.05 1102 0.00 0.05
WB  LT          22 1 1.00   22 1.00 0.00
WB  TH-RT      603 2 1.05  633 0.00 0.13
NB  TH           5 1 1.00    5 0.00 0.00
SB  LT-TH-RT   116 1 1.00  116 0.29 0.38

PART 3 (OPPOSING VOLUME ADJUSTMENTS)
LEFT TURN                OPPOSING APPROACH
BEING OPPOSED        VOLUMES      % OPPOSING LEFT TURN    # LANES     OPPOSING
                   LT   TH   RT       LT   TH   RT       LT  TH  RT    VOLUME
WESTBOUND           0  999   51        0    0    0        0   2   0       0
SOUTHBOUND          0    5    0      100  100  100        0   1   0       5

SATURATION FLOW ADJUSTMENT WORKSHEET
DIR LN GROUP  IDEAL N  Fwid   Fhv   Fgr Fpark  Fbus Farea   Frt   Flt    s
EB  TH-RT     1800  2 1.000 0.995 1.000 0.925 1.000 1.000 0.993 1.000 3288
WB  LT        1800  1 1.000 0.995 1.000 1.000 1.000 1.000 1.000 0.950 1701
WB  TH-RT     1800  2 1.000 0.995 1.000 0.930 1.000 1.000 0.981 1.000 3266
NB  TH        1800  1 1.000 1.000 1.000 0.880 1.000 1.000 1.000 1.000 1583
SB  LT-TH-RT  1800  1 1.000 1.000 1.000 0.880 1.000 1.000 0.825 1.000 1306
```

```
SUPPLEMENTAL WORKSHEET FOR LEFT-TURN ADJUSTMENT FACTOR FLT
INPUT VARIABLES
DIR  C   G  N   Va   Vm  Vlt  Plt No   Vo Plto
SB 100  20  1  116   82   34 0.29  1    5 0.00
CALCULATIONS
DIR Sop    Yo     Gu    Fs    Pl     Go    Pt     Gf       El    Fm   Flt
SB 1800 0.003 19.777 0.872 0.295  0.223 0.705  0.183    1.290 1.000 1.000

CAPACITY ANALYSIS WORKSHEET
DIR LN GROUP     v    s  v/s  g/C    c  v/c  CRITICAL
EB  TH-RT    1102 3288 0.34 0.56 1841 0.60     *
WB  LT         22 1701 0.01 0.15  255 0.09     *
WB  TH-RT     633 3266 0.19 0.74 2417 0.26
NB  TH          5 1583 0.00 0.20  317 0.02
SB  LT-TH-RT  116 1306 0.09 0.20  261 0.44     *

CYCLE=100.0  LOST= 9.0  SUM V/S CRIT= 0.44 TOTAL V/C= 0.48

LEVEL OF SERVICE WORKSHEET
DIR LN GROUP  v/c  g/C   C     d1    c      d2   PF    Delay LOS Avg Q  95% Q
EB  TH-RT    0.60 0.56 100.0  11.07 1841    0.40 0.85    9.74  B  12.8   13
WB  LT       0.09 0.15 100.0  27.82  255    0.00 1.00   27.82  D   0.5    1
WB  TH-RT    0.26 0.74 100.0   3.19 2417    0.01 0.85    2.72  A   4.4    4
NB  TH       0.02 0.20 100.0  24.40  317    0.00 0.85   20.74  C   0.1    1
SB  LT-TH-RT 0.44 0.20 100.0  26.69  261    0.81 0.85   23.37  C   2.6    3

DIR Delay LOS
EB   9.74  B
WB   3.58  A
NB  20.74  C
SB  23.37  C
INTERSECTION DELAY =  8.46 INTERSECTION LOS=B

THE CYCLE LENGTH WITHIN THE BOUNDS OF  100  TO  100 SECONDS
WHICH MINIMIZES CRITICAL MOVEMENT DELAY IS 100.0 SECONDS

FOR A V/C RATIO OF .95 THE CYCLE SHOULD BE  16.7 SECONDS
for chosen cycle length 100.0
suggested timing phase 1 is  69.8 secs green.   3.0 secs yellow + red clear
suggested timing phase 2 is  18.5 secs green.   3.0 secs yellow + red clear
suggested timing phase 3 is   2.7 secs green.   3.0 secs yellow + red clear
```

```
CINCH PROGRAM VERSION DATE 4-29-1985
1985 HCM - CHAPTER 9: SIGNALIZED - OPERATIONAL ANALYSIS
BU SCHOOL MGMT
COMM AVE/SHERBORN/BLANFORD 1997 AM NO-BUILD
date:01-28-1993             time:14:56:42
LAST DATA SET NAMES LOADED OR SAVED
VOLUME=COSBNBAM   GEOMETRICS=COSBNBAM   SIGNAL=COSBNBAM
LOCATED IN CBD:N
VOLUME & GEOMETRICS
       VOLUMES       # OF LANES      LANE WIDTH      CROSS
DIR  LT   TH   RT    LT TH RT      LT   TH   RT     WALK
EB    0  871   43     0  2  0     0.0 12.0  0.0     40
WB   21  538   72     1  2  0    12.0 12.0  0.0     40
NB    0    5    0     0  1  0     0.0 12.0  0.0     40
SB   28   31   36     0  1  0     0.0 12.0  0.0     40

TRAFFIC & ROADWAY CONDITIONS
               ADJ PARK             PEDESTRIANS        ARR
DIR GRADE %HV   Y/N MOVES BUSES  PHF CROSS BUT MIN TIME TYPE
EB  0.0%  1.0%   Y    10    0   .850  132   Y    17.0    3
WB  0.0%  1.0%   Y     8    0   .940   32   Y    17.0    3
NB  0.0%  0.0%   Y     4    0   %1.000   74   Y    17.0    3
SB  0.0%  0.0%   Y     4    0   .820  210   Y    17.0    3

PHASINGS
    EASTBOUND   WESTBOUND   NORTHBOUND  SOUTHBOUND GREEN  Y+R PRE/ACT
    l  t  r  p  l  t  r  p  l  t  r  p  l  t  r  p
 1     *  *        *  *                             56.0   3    A
 2                          *  *  *     *  *  *     20.0   3    A
 3              *  *  *                             15.0   3    A

CYCLE= 100.0

VOLUME ADJUSTMENT WORKSHEET
PART 1 (MOVEMENT ADJUSTMENTS)
DIR  LTV  THV  RTV   PHF  LTFR THFR RTFR
EB     0  871   43  .850     0 1025   51
WB    21  538   72  .940    22  572   77
NB     0    5    0  %1.000     0    5    0
SB    28   31   36  .820    34   38   44

PART 2 (LANE GROUP ADJUSTMENTS)
DIR LN GROUP  FLOW N   LU    v  Plt  Prt
EB  TH-RT     1075 2 1.05 1129 0.00 0.05
WB  LT          22 1 1.00   22 1.00 0.00
WB  TH-RT      649 2 1.05  681 0.00 0.12
NB  TH           5 1 1.00    5 0.00 0.00
SB  LT-TH-RT   116 1 1.00  116 0.29 0.38

PART 3 (OPPOSING VOLUME ADJUSTMENTS)
LEFT TURN                OPPOSING APPROACH
BEING OPPOSED        VOLUMES      % OPPOSING LEFT TURN    # LANES     OPPOSING
                  LT   TH   RT        LT   TH   RT       LT  TH  RT    VOLUME
WESTBOUND          0 1025   51         0    0    0        0   2   0        0
SOUTHBOUND         0    5    0       100  100  100        0   1   0        5

SATURATION FLOW ADJUSTMENT WORKSHEET
DIR LN GROUP  IDEAL N  Fwid   Fhv   Fgr Fpark  Fbus Farea   Frt   Flt    s
EB  TH-RT     1800  2 1.000 0.995 1.000 0.925 1.000 1.000 0.993 1.000 3288
WB  LT        1800  1 1.000 0.995 1.000 1.000 1.000 1.000 1.000 0.950 1701
WB  TH-RT     1800  2 1.000 0.995 1.000 0.930 1.000 1.000 0.982 1.000 3271
NB  TH        1800  1 1.000 1.000 1.000 0.880 1.000 1.000 1.000 1.000 1583
SB  LT-TH-RT  1800  1 1.000 1.000 1.000 0.880 1.000 1.000 0.825 1.000 1306

SUPPLEMENTAL WORKSHEET FOR LEFT-TURN ADJUSTMENT FACTOR FLT
```

```
INPUT VARIABLES
DIR  C   G  N   Va   Vm  Vlt  Plt No   Vo Plto
SB 100  20  1  116   82   34 0.29  1    5 0.00
CALCULATIONS
DIR Sop    Yo     Gu     Fs     Pl     Go    Pt     Gf      El    Fm   Flt
SB 1800 0.003 19.777 0.872 0.295  0.223 0.705  0.183   1.290 1.000 1.000

CAPACITY ANALYSIS WORKSHEET
DIR LN GROUP    v    s  v/s  g/C    c  v/c  CRITICAL
EB  TH-RT    1129 3288 0.34 0.56 1841 0.61     *
WB  LT         22 1701 0.01 0.15  255 0.09     *
WB  TH-RT     681 3271 0.21 0.74 2421 0.28
NB  TH          5 1583 0.00 0.20  317 0.02
SB  LT-TH-RT  116 1306 0.09 0.20  261 0.44     *

CYCLE=100.0  LOST= 9.0  SUM V/S CRIT= 0.45 TOTAL V/C= 0.49

LEVEL OF SERVICE WORKSHEET
DIR LN GROUP  v/c  g/C   C     d1    c      d2   PF   Delay LOS Avg Q  95% Q
EB  TH-RT     0.61 0.56 100.0  11.20 1841    0.44 0.85    9.90  B  13.1   13
WB  LT        0.09 0.15 100.0  27.82  255    0.00 1.00   27.82  D   0.5    1
WB  TH-RT     0.28 0.74 100.0   3.24 2421    0.02 0.85    2.77  A   4.7    5
NB  TH        0.02 0.20 100.0  24.40  317    0.00 0.85   20.74  C   0.1    1
SB  LT-TH-RT  0.44 0.20 100.0  26.69  261    0.81 0.85   23.37  C   2.6    3

DIR Delay LOS
EB   9.90  B
WB   3.57  A
NB  20.74  C
SB  23.37  C
INTERSECTION DELAY =  8.45 INTERSECTION LOS=B

THE CYCLE LENGTH WITHIN THE BOUNDS OF  100  TO  100 SECONDS
WHICH MINIMIZES CRITICAL MOVEMENT DELAY IS 100.0 SECONDS

FOR A V/C RATIO OF .95 THE CYCLE SHOULD BE  16.9 SECONDS
for chosen cycle length 100.0
suggested timing phase 1 is  70.2 secs green.   3.0 secs yellow + red clear
suggested timing phase 2 is  18.1 secs green.   3.0 secs yellow + red clear
suggested timing phase 3 is   2.7 secs green.   3.0 secs yellow + red clear
```

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CINCH PROGRAM VERSION DATE 4-29-1988
1985 HCM - CHAPTER 9: SIGNALIZED - OPERATIONAL ANALYSIS
BU SCHOOL MGMT
COMM AVE/SHERBORN/BLANFORD 1997 AM BUILD
date:01-15-1993            time:08:19:27
LAST DATA SET NAMES LOADED OR SAVED
VOLUME=COSBBAM    GEOMETRICS=COSBBAM    SIGNAL=COSBBAM
LOCATED IN CBD:N
VOLUME & GEOMETRICS
        VOLUMES      # OF LANES     LANE WIDTH     CROSS
DIR  LT   TH   RT    LT TH RT     LT   TH   RT     WALK
EB    0  892   43     0  2  0     0.0 12.0  0.0     40
WB   21  538   72     1  2  0    12.0 12.0  0.0     40
NB    0    5    0     0  1  0     0.0 12.0  0.0     40
SB   28   31   36     0  1  0     0.0 12.0  0.0     40

TRAFFIC & ROADWAY CONDITIONS
                 ADJ PARK            PEDESTRIANS       ARR
DIR GRADE %HV   Y/N MOVES BUSES  PHF CROSS BUT MIN TIME TYPE
EB  0.0%  1.0%   Y    10    0   .850  132   Y    17.0    3
WB  0.0%  1.0%   Y     8    0   .940   32   Y    17.0    3
NB  0.0%  0.0%   Y     4    0   %1.000   74   Y    17.0    3
SB  0.0%  0.0%   Y     4    0   .820  210   Y    17.0    3

PHASINGS
    EASTBOUND   WESTBOUND   NORTHBOUND  SOUTHBOUND GREEN  Y+R PRE/ACT
    l  t  r  p  l  t  r  p  l  t  r  p  l  t  r  p
 1     *  *        *  *                              56.0   3    A
 2                          *  *  *     *  *  *      20.0   3    A
 3                 *  *  *                           15.0   3    A

CYCLE= 100.0

VOLUME ADJUSTMENT WORKSHEET
PART 1 (MOVEMENT ADJUSTMENTS)
DIR  LTV  THV  RTV   PHF   LTFR THFR RTFR
EB     0  892   43  .850     0 1049   51
WB    21  538   72  .940    22  572   77
NB     0    5    0  %1.000    0    5    0
SB    28   31   36  .820    34   38   44

PART 2 (LANE GROUP ADJUSTMENTS)
DIR LN GROUP  FLOW N   LU    v  Plt  Prt
EB  TH-RT     1100 2 1.05 1155 0.00 0.05
WB  LT          22 1 1.00   22 1.00 0.00
WB  TH-RT      649 2 1.05  681 0.00 0.12
NB  TH           5 1 1.00    5 0.00 0.00
SB  LT-TH-RT   116 1 1.00  116 0.29 0.38

PART 3 (OPPOSING VOLUME ADJUSTMENTS)
LEFT TURN                OPPOSING APPROACH
BEING OPPOSED        VOLUMES       % OPPOSING LEFT TURN     # LANES      OPPOSING
                  LT   TH   RT         LT   TH   RT        LT  TH  RT     VOLUME
WESTBOUND          0 1049   51          0    0    0         0   2   0         0
SOUTHBOUND         0    5    0        100  100  100         0   1   0         5

SATURATION FLOW ADJUSTMENT WORKSHEET
DIR LN GROUP  IDEAL N  Fwid   Fhv   Fgr Fpark  Fbus Farea   Frt   Flt    s
EB  TH-RT     1800  2 1.000 0.995 1.000 0.925 1.000 1.000 0.993 1.000 3289
WB  LT        1800  1 1.000 0.995 1.000 1.000 1.000 1.000 1.000 0.950 1701
WB  TH-RT     1800  2 1.000 0.995 1.000 0.930 1.000 1.000 0.982 1.000 3271
NB  TH        1800  1 1.000 1.000 1.000 0.880 1.000 1.000 1.000 1.000 1583
SB  LT-TH-RT  1800  1 1.000 1.000 1.000 0.880 1.000 1.000 0.825 1.000 1306
```

```
SUPPLEMENTAL WORKSHEET FOR LEFT-TURN ADJUSTMENT FACTOR FLT
INPUT VARIABLES
DIR  C   G  N   Va   Vm  Vlt  Plt No   Vo Plto
SB 100  20  1  116   82   34 0.29  1    5 0.00
CALCULATIONS
DIR Soo    Yo      Gu     Fs    Pl     Gq    Pt     Gf       El    Fm   Flt
SB 1800 0.003 19.777 0.872 0.295  0.223 0.705  0.183    1.290 1.000 1.000

CAPACITY ANALYSIS WORKSHEET
DIR LN GROUP    v    s  v/s  g/C    c  v/c  CRITICAL
EB  TH-RT    1155 3289 0.35 0.56 1842 0.63     *
WB  LT         22 1701 0.01 0.15  255 0.09     *
WB  TH-RT     681 3271 0.21 0.74 2421 0.28
NB  TH          5 1583 0.00 0.20  317 0.02
SB  LT-TH-RT  116 1306 0.09 0.20  261 0.44     *

CYCLE=100.0  LOST= 9.0  SUM V/S CRIT= 0.45 TOTAL V/C= 0.50

LEVEL OF SERVICE WORKSHEET
DIR LN GROUP  v/c  g/C   C     d1    c      d2   PF   Delay LOS Avg Q  95% Q
EB  TH-RT    0.63 0.56 100.0  11.34 1842    0.49 0.85   10.06  B  13.4    13
WB  LT       0.09 0.15 100.0  27.82  255    0.00 1.00   27.82  D   0.5     1
WB  TH-RT    0.28 0.74 100.0   3.24 2421    0.02 0.85    2.77  A   4.7     5
NB  TH       0.02 0.20 100.0  24.40  317    0.00 0.85   20.74  C   0.1     1
SB  LT-TH-RT 0.44 0.20 100.0  26.69  261    0.81 0.85   23.37  C   2.6     3

DIR Delay LOS
EB  10.06  B
WB   3.57  A
NB  20.74  C
SB  23.37  C
INTERSECTION DELAY =  8.56 INTERSECTION LOS=B

THE CYCLE LENGTH WITHIN THE BOUNDS OF  100  TO  100 SECONDS
WHICH MINIMIZES CRITICAL MOVEMENT DELAY IS 100.0 SECONDS

FOR A V/C RATIO OF .95 THE CYCLE SHOULD BE  17.2 SECONDS
for chosen cycle length 100.0
suggested timing phase 1 is  70.5 secs green.   3.0 secs yellow + red clear
suggested timing phase 2 is  17.8 secs green.   3.0 secs yellow + red clear
suggested timing phase 3 is   2.6 secs green.   3.0 secs yellow + red clear
```

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CINCH PROGRAM VERSION DATE 4-29-1988
1985 HCM - CHAPTER 9: SIGNALIZED - OPERATIONAL ANALYSIS
BU SCHOOL MGMT
COMM AVE/SHERBORN/BLANFORD EXISTING PM
date:01-13-1993           time:14:24:38
LAST DATA SET NAMES LOADED OR SAVED
VOLUME=COSBEXPM   GEOMETRICS=COSBEXPM   SIGNAL=COSBEXPM
LOCATED IN CBD:N
VOLUME & GEOMETRICS
        VOLUMES      # OF LANES     LANE WIDTH     CROSS
DIR  LT   TH   RT    LT TH RT      LT   TH   RT     WALK
EB    0  969  149     0  2  0     0.0 12.0  0.0     40
WB   33  931   88     1  2  0    12.0 12.0  0.0     40
NB    5    3    8     0  1  0     0.0 12.0  0.0     40
SB   45   23   97     0  1  0     0.0 12.0  0.0     40

TRAFFIC & ROADWAY CONDITIONS
                 ADJ PARK             PEDESTRIANS        ARR
DIR GRADE %HV   Y/N MOVES BUSES  PHF CROSS BUT MIN TIME TYPE
EB  0.0%  1.0%   Y    10    0   .930  126   Y    17.0    3
WB  0.0%  1.0%   Y     8    0   .920  173   Y    17.0    3
NB  0.0%  0.0%   Y     4    0   %1.000  142   Y    17.0    3
SB  0.0%  0.0%   Y     4    0   .820  119   Y    17.0    3

PHASINGS
    EASTBOUND   WESTBOUND   NORTHBOUND  SOUTHBOUND GREEN  Y+R PRE/ACT
    l  t  r  p  l  t  r  p  l  t  r  p  l  t  r  p
 1     *  *           *  *                          57.0   3    A
 2                          *  *  *     *  *  *     26.0   3    A
 3                 *  *  *                          18.0   3    A

CYCLE= 110.0

VOLUME ADJUSTMENT WORKSHEET
PART 1 (MOVEMENT ADJUSTMENTS)
DIR  LTV  THV  RTV   PHF  LTFR THFR RTFR
EB     0  969  149  .930     0 1042  160
WB    33  931   88  .920    36 1012   96
NB     5    3    8  %1.000     5    3    8
SB    45   23   97  .820    55   28  118

PART 2 (LANE GROUP ADJUSTMENTS)
DIR LN GROUP  FLOW N   LU    v  Plt  Prt
EB  TH-RT     1202 2 1.05 1262 0.00 0.13
WB  LT          36 1 1.00   36 1.00 0.00
WB  TH-RT     1108 2 1.05 1163 0.00 0.09
NB  LT-TH-RT    16 1 1.00   16 0.31 0.50
SB  LT-TH-RT   201 1 1.00  201 0.27 0.59

PART 3 (OPPOSING VOLUME ADJUSTMENTS)
LEFT TURN                OPPOSING APPROACH
BEING OPPOSED        VOLUMES      % OPPOSING LEFT TURN     # LANES      OPPOSING
                  LT   TH   RT       LT   TH   RT        LT  TH  RT      VOLUME
WESTBOUND          0 1042  160        0    0    0         0   2   0         0
NORTHBOUND        55   28  118      100  100  100         0   1   0       146
SOUTHBOUND         5    3    8      100  100  100         0   1   0        11

SATURATION FLOW ADJUSTMENT WORKSHEET
DIR LN GROUP  IDEAL N  Fwid   Fhv   For Fpark  Fbus Farea   Frt   Flt    s
EB  TH-RT      1800  2 1.000 0.995 1.000 0.925 1.000 1.000 0.980 1.000 3245
WB  LT         1800  1 1.000 0.995 1.000 1.000 1.000 1.000 1.000 0.950 1701
WB  TH-RT      1800  2 1.000 0.995 1.000 0.930 1.000 1.000 0.987 1.000 3287
NB  LT-TH-RT   1800  1 1.000 1.000 1.000 0.880 1.000 1.000 0.791 0.839 1051
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SB  LT-TH-RT  1800  1 1.000 1.000 1.000 0.880 1.000 1.000 0.785 1.000 1243

SUPPLEMENTAL WORKSHEET FOR LEFT-TURN ADJUSTMENT FACTOR FLT
INPUT VARIABLES
DIR  C   G  N   Va   Vm  Vlt  Plt No   Vo Plto
NB 110  26  1   16   11    5 0.31  1  146 0.27
SB 110  26  1  201  146   55 0.27  1   11 0.31
CALCULATIONS
DIR Sop    Yo      Gu     Fs    Pl      Gq    Pt     Gf       El    Fm   Flt
NB 1666 0.088 17.909 0.784 0.313  8.091 0.688  3.434    1.436 0.839 0.839
SB 1584 0.007 25.413 0.868 0.273  0.587 0.727  0.476    1.296 1.000 1.000

CAPACITY ANALYSIS WORKSHEET
DIR LN GROUP     v    s  v/s  g/C    c  v/c  CRITICAL
EB  TH-RT    1262 3245 0.39 0.52 1682 0.75     *
WB  LT         36 1701 0.02 0.16  278 0.13     *
WB  TH-RT    1163 3287 0.35 0.71 2331 0.50
NB  LT-TH-RT   16 1051 0.02 0.24  249 0.06
SB  LT-TH-RT  201 1243 0.16 0.24  294 0.68     *

CYCLE=110.0  LOST= 9.0  SUM V/S CRIT= 0.57 TOTAL V/C= 0.62

LEVEL OF SERVICE WORKSHEET
DIR LN GROUP  v/c  g/C   C     d1    c      d2   PF   Delay LOS Avg Q  95% Q
EB  TH-RT    0.75 0.52 110.0  15.88 1682    1.36 0.85   14.65  B  17.7   18
WB  LT       0.13 0.16 110.0  29.87  278    0.01 1.00   29.88  D   0.9    2
WB  TH-RT    0.50 0.71 110.0   5.47 2331    0.15 0.85    4.78  A   9.8   10
NB  LT-TH-RT 0.06 0.24 110.0  24.75  249    0.00 0.85   21.04  C   0.4    1
SB  LT-TH-RT 0.68 0.24 110.0  29.08  294    4.41 0.85   28.47  D   4.7    6

DIR Delay LOS
EB  14.65  B
WB   5.53  B
NB  21.04  C
SB  28.47  D
INTERSECTION DELAY = 11.64 INTERSECTION LOS=B

THE CYCLE LENGTH WITHIN THE BOUNDS OF  110  TO  110 SECONDS
WHICH MINIMIZES CRITICAL MOVEMENT DELAY IS 110.0 SECONDS

FOR A V/C RATIO OF .95 THE CYCLE SHOULD BE  22.6 SECONDS
for chosen cycle length 110.0
suggested timing phase 1 is  68.7 secs green,   3.0 secs yellow + red clear
suggested timing phase 2 is  28.6 secs green,   3.0 secs yellow + red clear
suggested timing phase 3 is   3.7 secs green.   3.0 secs yellow + red clear
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CINCH PROGRAM VERSION DATE 4-29-1988
1985 HCM - CHAPTER 9: SIGNALIZED - OPERATIONAL ANALYSIS
BU SCHOOL MGMT
COMM AVE/SHERBORN/BLANFORD 1997 PM NO-BUILD
date:01-28-1993            time:14:57:54
LAST DATA SET NAMES LOADED OR SAVED
VOLUME=COSBNBPM   GEOMETRICS=COSBNBPM   SIGNAL=COSBNBPM
LOCATED IN CBD:N
VOLUME & GEOMETRICS
        VOLUMES      # OF LANES     LANE WIDTH     CROSS
DIR  LT   TH   RT    LT TH RT      LT   TH   RT    WALK
EB    0 1032  149     0  2  0     0.0 12.0  0.0     40
WB   33  971   88     1  2  0    12.0 12.0  0.0     40
NB    5    3    8     0  1  0     0.0 12.0  0.0     40
SB   45   23   97     0  1  0     0.0 12.0  0.0     40

TRAFFIC & ROADWAY CONDITIONS
                  ADJ PARK             PEDESTRIANS        ARR
DIR GRADE %HV   Y/N MOVES BUSES  PHF CROSS BUT MIN TIME TYPE
EB  0.0%  1.0%   Y    10    0   .930  126   Y    17.0    3
WB  0.0%  1.0%   Y     8    0   .920  173   Y    17.0    3
NB  0.0%  0.0%   Y     4    0  %1.000  142   Y    17.0    3
SB  0.0%  0.0%   Y     4    0   .820  119   Y    17.0    3

PHASINGS
    EASTBOUND   WESTBOUND   NORTHBOUND  SOUTHBOUND GREEN  Y+R PRE/ACT
    l  t  r  p  l  t  r  p  l  t  r  p  l  t  r  p
 1     *  *        *  *                              57.0   3    A
 2                          *  *  *     *  *  *      26.0   3    A
 3              *  *  *                              18.0   3    A

CYCLE= 110.0

VOLUME ADJUSTMENT WORKSHEET
PART 1 (MOVEMENT ADJUSTMENTS)
DIR  LTV  THV  RTV   PHF  LTFR THFR RTFR
EB     0 1032  149  .930     0 1110  160
WB    33  971   88  .920    36 1055   96
NB     5    3    8  %1.000     5    3    8
SB    45   23   97  .820    55   28  118

PART 2 (LANE GROUP ADJUSTMENTS)
DIR LN GROUP  FLOW N   LU    v  Plt  Prt
EB  TH-RT     1270 2 1.05 1333 0.00 0.13
WB  LT          36 1 1.00   36 1.00 0.00
WB  TH-RT     1151 2 1.05 1209 0.00 0.08
NB  LT-TH-RT    16 1 1.00   16 0.31 0.50
SB  LT-TH-RT   201 1 1.00  201 0.27 0.59

PART 3 (OPPOSING VOLUME ADJUSTMENTS)
LEFT TURN                 OPPOSING APPROACH
BEING OPPOSED        VOLUMES       % OPPOSING LEFT TURN    # LANES      OPPOSING
                  LT   TH   RT       LT   TH   RT        LT  TH  RT     VOLUME
WESTBOUND          0 1110  160        0    0    0         0   2   0        0
NORTHBOUND        55   28  118      100  100  100         0   1   0      146
SOUTHBOUND         5    3    8      100  100  100         0   1   0       11

SATURATION FLOW ADJUSTMENT WORKSHEET
DIR LN GROUP  IDEAL N  Fwid   Fhv   For Fpark  Fbus Farea   Frt   Flt    s
EB  TH-RT     1800  2 1.000 0.995 1.000 0.925 1.000 1.000 0.981 1.000 3249
WB  LT        1800  1 1.000 0.995 1.000 1.000 1.000 1.000 1.000 0.950 1701
WB  TH-RT     1800  2 1.000 0.995 1.000 0.930 1.000 1.000 0.988 1.000 3288
NB  LT-TH-RT  1800  1 1.000 1.000 1.000 0.880 1.000 1.000 0.791 0.839 1051
SB  LT-TH-RT  1800  1 1.000 1.000 1.000 0.880 1.000 1.000 0.785 1.000 1243
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SUPPLEMENTAL WORKSHEET FOR LEFT-TURN ADJUSTMENT FACTOR FLT
INPUT VARIABLES
DIR  C   G  N   Va   Vm  Vlt  Plt No   Vo Plto
NB 110  26  1   16   11    5 0.31  1  146 0.27
SB 110  26  1  201  146   55 0.27  1   11 0.31
CALCULATIONS
DIR Sop    Yo     Gu     Fs    Pl     Gq    Pt     Gf       El    Fm   Flt
NB 1666 0.088 17.909 0.784 0.313  8.091 0.688  3.434    1.436 0.839 0.839
SB 1584 0.007 25.413 0.868 0.273  0.587 0.727  0.476    1.296 1.000 1.000

CAPACITY ANALYSIS WORKSHEET
DIR LN GROUP    v    s  v/s  g/C    c  v/c  CRITICAL
EB  TH-RT    1333 3249 0.41 0.52 1684 0.79     *
WB  LT         36 1701 0.02 0.16  278 0.13     *
WB  TH-RT    1209 3288 0.37 0.71 2332 0.52
NB  LT-TH-RT   16 1051 0.02 0.24  249 0.06
SB  LT-TH-RT  201 1243 0.16 0.24  294 0.68     *

CYCLE=110.0  LOST= 9.0  SUM V/S CRIT= 0.59 TOTAL V/C= 0.65

LEVEL OF SERVICE WORKSHEET
DIR LN GROUP  v/c  g/C   C     d1    c      d2   PF   Delay LOS Avg Q  95% Q
EB  TH-RT     0.79 0.52 110.0  16.46 1684    1.88 0.85   15.59  C  18.7   19
WB  LT        0.13 0.16 110.0  29.87  278    0.01 1.00   29.88  D   0.9    2
WB  TH-RT     0.52 0.71 110.0   5.59 2332    0.17 0.85    4.90  A  10.2   10
NB  LT-TH-RT 0.06 0.24 110.0  24.75  249    0.00 0.85   21.04  C   0.4    1
SB  LT-TH-RT 0.68 0.24 110.0  29.08  294    4.41 0.85   28.47  D   4.7    6

DIR Delay LOS
EB  15.59  C
WB   5.62  B
NB  21.04  C
SB  28.47  D
INTERSECTION DELAY = 12.11 INTERSECTION LOS=B

THE CYCLE LENGTH WITHIN THE BOUNDS OF  110  TO  110 SECONDS
WHICH MINIMIZES CRITICAL MOVEMENT DELAY IS 110.0 SECONDS

FOR A V/C RATIO OF .95 THE CYCLE SHOULD BE  24.0 SECONDS
for chosen cycle length 110.0
suggested timing phase 1 is  69.9 secs green.   3.0 secs yellow + red clear
suggested timing phase 2 is  27.5 secs green.   3.0 secs yellow + red clear
suggested timing phase 3 is   3.6 secs green.   3.0 secs yellow + red clear
```

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CINCH PROGRAM VERSION DATE 4-29-1986
1985 HCM - CHAPTER 9: SIGNALIZED - OPERATIONAL ANALYSIS
BU SCHOOL MGMT
COMM AVE/SHERBORN/BLANFORD 1997 PM BUILD
date:01-15-1993            time:08:23:25
LAST DATA SET NAMES LOADED OR SAVED
VOLUME=COSBBPM    GEOMETRICS=COSBBPM    SIGNAL=COSBBPM
LOCATED IN CBD:N
VOLUME & GEOMETRICS
        VOLUMES      # OF LANES     LANE WIDTH     CROSS
DIR  LT   TH   RT    LT TH RT      LT    TH    RT    WALK
EB    0 1032  149     0  2  0      0.0 12.0  0.0    40
WB   56 1005   88     1  2  0     12.0 12.0  0.0    40
NB    5    3    8     0  1  0      0.0 12.0  0.0    40
SB   45   23   97     0  1  0      0.0 12.0  0.0    40

TRAFFIC & ROADWAY CONDITIONS
                 ADJ PARK              PEDESTRIANS        ARR
DIR GRADE %HV   Y/N MOVES BUSES  PHF CROSS BUT MIN TIME TYPE
EB  0.0%  1.0%   Y    10    0   .930  126   Y    17.0    3
WB  0.0%  1.0%   Y     8    0   .920  173   Y    17.0    3
NB  0.0%  0.0%   Y     4    0   %1.000  142   Y    17.0    3
SB  0.0%  0.0%   Y     4    0   .820  119   Y    17.0    3

PHASINGS
    EASTBOUND   WESTBOUND   NORTHBOUND  SOUTHBOUND GREEN  Y+R PRE/ACT
    l  t  r  p  l  t  r  p  l  t  r  p  l  t  r  p
 1     *  *        *  *                             57.0   3    A
 2                          *  *  *     *  *  *     26.0   3    A
 3              *  *  *                             18.0   3    A

CYCLE= 110.0

VOLUME ADJUSTMENT WORKSHEET
PART 1 (MOVEMENT ADJUSTMENTS)
DIR  LTV  THV  RTV   PHF  LTFR THFR RTFR
EB     0 1032  149  .930     0 1110  160
WB    56 1005   88  .920    61 1092   96
NB     5    3    8  %1.000     5    3    8
SB    45   23   97  .820    55   28  118

PART 2 (LANE GROUP ADJUSTMENTS)
DIR LN GROUP   FLOW N   LU    v  Plt  Prt
EB  TH-RT      1270 2 1.05 1333 0.00 0.13
WB  LT           61 1 1.00   61 1.00 0.00
WB  TH-RT      1188 2 1.05 1247 0.00 0.08
NB  LT-TH-RT     16 1 1.00   16 0.31 0.50
SB  LT-TH-RT    201 1 1.00  201 0.27 0.59

PART 3 (OPPOSING VOLUME ADJUSTMENTS)
LEFT TURN                 OPPOSING APPROACH
BEING OPPOSED       VOLUMES       % OPPOSING LEFT TURN     # LANES      OPPOSING
                 LT   TH   RT        LT   TH   RT        LT  TH  RT     VOLUME
WESTBOUND         0 1110  160         0    0    0         0   2   0         0
NORTHBOUND       55   28  118       100  100  100         0   1   0       146
SOUTHBOUND        5    3    8       100  100  100         0   1   0        11

SATURATION FLOW ADJUSTMENT WORKSHEET
DIR LN GROUP  IDEAL N  Fwid   Fhv   For Fpark  Fbus Farea   Frt   Flt    s
EB  TH-RT     1800  2 1.000 0.995 1.000 0.925 1.000 1.000 0.981 1.000 3249
WB  LT        1800  1 1.000 0.995 1.000 1.000 1.000 1.000 1.000 0.950 1701
WB  TH-RT     1800  2 1.000 0.995 1.000 0.930 1.000 1.000 0.988 1.000 3290
NB  LT-TH-RT  1800  1 1.000 1.000 1.000 0.880 1.000 1.000 0.791 0.839 1051
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SB  LT-TH-RT  1800  1 1.000 1.000 1.000 0.880 1.000 1.000 0.785 1.000 1243

SUPPLEMENTAL WORKSHEET FOR LEFT-TURN ADJUSTMENT FACTOR FLT
INPUT VARIABLES
DIR  C   G  N   Va   Vm  Vlt  Plt No   Vo Plto
NB 110  26  1   16   11    5 0.31  1  146 0.27
SB 110  26  1  201  146   55 0.27  1   11 0.31
CALCULATIONS
DIR Sop    Yo     Gu     Fs    Pl     Go    Pt     Gf       El    Fm   Flt
NB 1666 0.088 17.909 0.784 0.313  8.091 0.688  3.434    1.436 0.839 0.839
SB 1584 0.007 25.413 0.868 0.273  0.587 0.727  0.476    1.296 1.000 1.000

CAPACITY ANALYSIS WORKSHEET
DIR LN GROUP     v     s  v/s  g/C    c  v/c  CRITICAL
EB  TH-RT     1333 3249 0.41 0.52 1684 0.79     *
WB  LT          61 1701 0.04 0.16  278 0.22     *
WB  TH-RT     1247 3290 0.38 0.71 2333 0.53
NB  LT-TH-RT    16 1051 0.02 0.24  249 0.06
SB  LT-TH-RT   201 1243 0.16 0.24  294 0.68     *

CYCLE=110.0  LOST= 9.0  SUM V/S CRIT= 0.61 TOTAL V/C= 0.66

LEVEL OF SERVICE WORKSHEET
DIR LN GROUP  v/c  g/C    C     d1    c      d2   PF   Delay LOS Avg Q  95% Q
EB  TH-RT     0.79 0.52 110.0  16.46 1684    1.88 0.85   15.59  C  18.7   19
WB  LT        0.22 0.16 110.0  30.32  278    0.07 1.00   30.39  D   1.6    2
WB  TH-RT     0.53 0.71 110.0   5.70 2333    0.19 0.85    5.01  B  10.6   11
NB  LT-TH-RT 0.06 0.24 110.0  24.75  249    0.00 0.85   21.04  C   0.4    1
SB  LT-TH-RT 0.68 0.24 110.0  29.08  294    4.41 0.85   28.47  D   4.7    6

DIR Delay LOS
EB  15.59  C
WB   6.19  B
NB  21.04  C
SB  28.47  D
INTERSECTION DELAY = 12.23 INTERSECTION LOS=B

THE CYCLE LENGTH WITHIN THE BOUNDS OF  110  TO  110 SECONDS
WHICH MINIMIZES CRITICAL MOVEMENT DELAY IS 110.0 SECONDS

FOR A V/C RATIO OF .95 THE CYCLE SHOULD BE  25.0 SECONDS
for chosen cycle length 110.0
suggested timing phase 1 is  68.2 secs green.   3.0 secs yellow + red clear
suggested timing phase 2 is  26.9 secs green.   3.0 secs yellow + red clear
suggested timing phase 3 is   5.9 secs green.   3.0 secs yellow + red clear
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CINCH PROGRAM VERSION DATE 4-29-1988
1985 HCM - CHAPTER 9: SIGNALIZED - OPERATIONAL ANALYSIS
BU SCHOOL MGMT
KENMORE SQUARE EXISTING AM
date:01-13-1993          time:14:28:33
LAST DATA SET NAMES LOADED OR SAVED
VOLUME=KESQEXAM   GEOMETRICS=KESQEXAM   SIGNAL=KESQEXAM
LOCATED IN CBD:N
VOLUME & GEOMETRICS
        VOLUMES      # OF LANES     LANE WIDTH     CROSS
DIR  LT   TH   RT    LT TH RT      LT   TH   RT    WALK
EB    0  989   42     0  2  0     0.0 15.0  0.0     33
WB    0 1105  523     0  3  2     0.0 11.0 15.0     58
NB    0    0  298     0  0  2     0.0  0.0 15.0     40
SB    0  723   65     0  3  1     0.0 12.0 15.0     35

TRAFFIC & ROADWAY CONDITIONS
                   ADJ PARK           PEDESTRIANS       ARR
DIR GRADE %HV   Y/N MOVES BUSES  PHF CROSS BUT MIN TIME TYPE
EB  0.0%  1.0%   Y     5    1   .900  253   Y    21.5    3
WB  0.0%  3.0%   Y     5    1   .820   82   Y    21.5    3
NB  0.0%  5.0%         0    0   .810  367   Y    17.0    3
SB  0.0%  3.0%   Y     5    1   .880   84   Y    17.0    3

PHASINGS
    EASTBOUND   WESTBOUND   NORTHBOUND  SOUTHBOUND GREEN  Y+R PRE/ACT
    l  t  r  p  l  t  r  p  l  t  r  p  l  t  r  p
 1                    *           *        *  *     28.0   3    A
 2     *  *                                         37.0   3    A
 3                 *  *                             26.0   3    A

CYCLE= 100.0

VOLUME ADJUSTMENT WORKSHEET
PART 1 (MOVEMENT ADJUSTMENTS)
DIR  LTV  THV  RTV   PHF  LTFR THFR RTFR
EB     0  989   42  .900     0 1099   47
WB     0 1105  523  .820     0 1348  638
NB     0    0  298  .810     0    0  368
SB     0  723   65  .880     0  822   74

PART 2 (LANE GROUP ADJUSTMENTS)
DIR LN GROUP   FLOW N   LU    v  Plt  Prt
EB  TH-RT      1146 2 1.05 1203 0.00 0.04
WB  TH         1348 3 1.10 1482 0.00 0.00
WB  RT          638 2 1.05  670 0.00 1.00
NB  RT          368 2 1.05  386 0.00 1.00
SB  TH          822 3 1.10  904 0.00 0.00
SB  RT           74 1 1.00   74 0.00 1.00

PART 3 (OPPOSING VOLUME ADJUSTMENTS)
LEFT TURN                OPPOSING APPROACH
BEING OPPOSED        VOLUMES      % OPPOSING LEFT TURN    # LANES     OPPOSING
                  LT   TH   RT        LT   TH   RT        LT  TH  RT    VOLUME

SATURATION FLOW ADJUSTMENT WORKSHEET
DIR LN GROUP  IDEAL N  Fwid   Fhv   For  Fpark  Fbus Farea   Frt   Flt     s
EB  TH-RT      1800  2 1.100 0.995 1.000 0.937 0.998 1.000 0.994 1.000 3663
WB  TH         1800  3 0.967 0.985 1.000 1.000 1.000 1.000 1.000 1.000 5143
WB  RT         1800  2 1.100 0.985 1.000 0.937 0.998 1.000 0.750 1.000 2737
NB  RT         1800  2 1.100 0.976 1.000 1.000 1.000 1.000 0.750 1.000 2898
SB  TH         1800  3 1.000 0.985 1.000 1.000 1.000 1.000 1.000 1.000 5320
SB  RT         1800  1 1.100 0.985 1.000 0.875 0.996 1.000 0.850 1.000 1444
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CAPACITY ANALYSIS WORKSHEET
DIR LN GROUP     v     s  v/s  g/C     c  v/c  CRITICAL
EB  TH-RT     1203 3663 0.33 0.37 1355 0.89     *
WB  TH        1482 5143 0.29 0.26 1337 1.11     *
WB  RT         670 2737 0.24 0.57 1560 0.43
NB  RT         386 2898 0.13 0.28  811 0.48
SB  TH         904 5320 0.17 0.28 1490 0.61     *
SB  RT          74 1444 0.05 0.28  404 0.18

CYCLE=100.0  LOST= 9.0  SUM V/S CRIT= 0.79 TOTAL V/C= 0.86

LEVEL OF SERVICE WORKSHEET
DIR LN GROUP  v/c  g/C   C      d1    c       d2   PF   Delay LOS Avg Q  95% Q
EB  TH-RT     0.89 0.37 100.0  22.46 1355    5.40 0.85   23.68  C  20.0    24
WB  TH        1.11 0.26 100.0  29.24 1337   56.73 0.85   73.07  F  41.2    83
WB  RT        0.43 0.57 100.0   9.30 1560    0.12 0.85    8.01  B   7.6     8
NB  RT        0.48 0.28 100.0  22.73  811    0.35 0.85   19.62  C   7.4     7
SB  TH        0.61 0.28 100.0  23.73 1490    0.52 0.85   20.61  C  16.4    16
SB  RT        0.18 0.28 100.0  20.76  404    0.03 0.85   17.67  C   1.5     2

DIR Delay LOS
EB  23.68  C
WB  52.83  E
NB  19.62  C
SB  20.39  C
INTERSECTION DELAY = 35.96 INTERSECTION LOS=D

THE CYCLE LENGTH WITHIN THE BOUNDS OF  100  TO  100 SECONDS
WHICH MINIMIZES CRITICAL MOVEMENT DELAY IS 100.0 SECONDS

FOR A V/C RATIO OF .95 THE CYCLE SHOULD BE  52.3 SECONDS
for chosen cycle length 100.0
suggested timing phase 1 is  19.7 secs green,   3.0 secs yellow + red clear
suggested timing phase 2 is  38.0 secs green,   3.0 secs yellow + red clear
suggested timing phase 3 is  33.3 secs green,   3.0 secs yellow + red clear
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CINCH PROGRAM VERSION DATE 4-29-1985
1985 HCM - CHAPTER 9: SIGNALIZED - OPERATIONAL ANALYSIS
BU SCHOOL MGMT
KENMORE SQUARE 1997 AM NO-BUILD
date:01-28-1993            time:14:58:52
LAST DATA SET NAMES LOADED OR SAVED
VOLUME=KESONBAM   GEOMETRICS=KESONBAM   SIGNAL=KESONBAM
LOCATED IN CBD:N
VOLUME & GEOMETRICS
        VOLUMES      # OF LANES     LANE WIDTH     CROSS
DIR  LT   TH   RT    LT TH RT      LT   TH   RT    WALK
EB    0 1014   42     0  2  0     0.0 15.0  0.0    33
WB    0 1155  566     0  3  2     0.0 11.0 15.0    58
NB    0    0  333     0  0  2     0.0  0.0 15.0    40
SB    0  742   65     0  3  1     0.0 12.0 15.0    35

TRAFFIC & ROADWAY CONDITIONS
                 ADJ PARK            PEDESTRIANS        ARR
DIR GRADE %HV   Y/N MOVES BUSES  PHF CROSS BUT MIN TIME TYPE
EB  0.0%  1.0%   Y     5    1   .900  253   Y    21.5    3
WB  0.0%  3.0%   Y     5    1   .820   82   Y    21.5    3
NB  0.0%  5.0%         0    0   .810  367   Y    17.0    3
SB  0.0%  3.0%   Y     5    1   .880   84   Y    17.0    3

PHASINGS
    EASTBOUND   WESTBOUND   NORTHBOUND  SOUTHBOUND GREEN  Y+R PRE/ACT
    l  t  r  p  l  t  r  p  l  t  r  p  l  t  r  p
 1                    *           *        *  *      28.0   3    A
 2     *  *                                          37.0   3    A
 3                 *  *                              26.0   3    A

CYCLE= 100.0

VOLUME ADJUSTMENT WORKSHEET
PART 1 (MOVEMENT ADJUSTMENTS)
DIR  LTV  THV  RTV   PHF  LTFR THFR RTFR
EB     0 1014   42  .900     0 1127   47
WB     0 1155  566  .820     0 1409  690
NB     0    0  333  .810     0    0  411
SB     0  742   65  .880     0  843   74

PART 2 (LANE GROUP ADJUSTMENTS)
DIR LN GROUP  FLOW N   LU    v  Plt  Prt
EB  TH-RT     1173 2 1.05 1232 0.00 0.04
WB  TH        1409 3 1.10 1549 0.00 0.00
WB  RT         690 2 1.05  725 0.00 1.00
NB  RT         411 2 1.05  432 0.00 1.00
SB  TH         843 3 1.10  928 0.00 0.00
SB  RT          74 1 1.00   74 0.00 1.00

PART 3 (OPPOSING VOLUME ADJUSTMENTS)
LEFT TURN                OPPOSING APPROACH
BEING OPPOSED       VOLUMES      % OPPOSING LEFT TURN    # LANES     OPPOSING
                 LT   TH   RT        LT   TH   RT       LT  TH  RT    VOLUME

SATURATION FLOW ADJUSTMENT WORKSHEET
DIR LN GROUP  IDEAL N  Fwid   Fhv   Fgr Fpark  Fbus Farea   Frt   Flt    s
EB  TH-RT     1800  2 1.100 0.995 1.000 0.937 0.998 1.000 0.994 1.000 3663
WB  TH        1800  3 0.967 0.985 1.000 1.000 1.000 1.000 1.000 1.000 5143
WB  RT        1800  2 1.100 0.985 1.000 0.937 0.998 1.000 0.750 1.000 2737
NB  RT        1800  2 1.100 0.976 1.000 1.000 1.000 1.000 0.750 1.000 2898
SB  TH        1800  3 1.000 0.985 1.000 1.000 1.000 1.000 1.000 1.000 5320
SB  RT        1800  1 1.100 0.985 1.000 0.875 0.996 1.000 0.850 1.000 1444
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CAPACITY ANALYSIS WORKSHEET
DIR LN GROUP     v     s  v/s  g/C     c  v/c  CRITICAL
EB  TH-RT    1232 3663 0.34 0.37 1355 0.91      *
WB  TH       1549 5143 0.30 0.26 1337 1.16      *
WB  RT        725 2737 0.26 0.57 1560 0.46
NB  RT        432 2898 0.15 0.28  811 0.53
SB  TH        928 5320 0.17 0.28 1490 0.62      *
SB  RT         74 1444 0.05 0.28  404 0.18

CYCLE=100.0  LOST= 9.0  SUM V/S CRIT= 0.81 TOTAL V/C= 0.89

LEVEL OF SERVICE WORKSHEET
DIR LN GROUP  v/c  g/C    C      d1     c       d2   PF   Delay LOS Avg Q  95% Q
EB  TH-RT    0.91 0.37 100.0  22.72 1355    6.70 0.85   25.01  D  20.5   25
WB  TH       1.16 0.26 100.0  29.78 1337   82.78 0.85   95.67  F  51.9  113
WB  RT       0.46 0.57 100.0   9.56 1560    0.17 0.85    8.26  B   8.2    8
NB  RT       0.53 0.28 100.0  23.15  811    0.54 0.85   20.14  C   8.2    8
SB  TH       0.62 0.28 100.0  23.86 1490    0.59 0.85   20.78  C  16.9   17
SB  RT       0.18 0.28 100.0  20.76  404    0.03 0.85   17.67  C   1.5    2

DIR Delay LOS
EB  25.01  D
WB  67.82  F
NB  20.14  C
SB  20.55  C
INTERSECTION DELAY = 43.39 INTERSECTION LOS=E

THE CYCLE LENGTH WITHIN THE BOUNDS OF  100  TO  100 SECONDS
WHICH MINIMIZES CRITICAL MOVEMENT DELAY IS 100.0 SECONDS

FOR A V/C RATIO OF .95 THE CYCLE SHOULD BE  61.9 SECONDS
for chosen cycle length 100.0
suggested timing phase 1 is  19.5 secs green,   3.0 secs yellow + red clear
suggested timing phase 2 is  37.7 secs green,   3.0 secs yellow + red clear
suggested timing phase 3 is  33.8 secs green,   3.0 secs yellow + red clear
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CINCH PROGRAM VERSION DATE 4-29-1988
1985 HCM - CHAPTER 9: SIGNALIZED - OPERATIONAL ANALYSIS
BU SCHOOL MGMT
KENMORE SQUARE 1997 AM BUILD
date:01-15-1993            time:13:50:33
LAST DATA SET NAMES LOADED OR SAVED
VOLUME=KESQBAM    GEOMETRICS=KESQBAM    SIGNAL=KESQBAM
LOCATED IN CBD:N
VOLUME & GEOMETRICS
        VOLUMES      # OF LANES     LANE WIDTH     CROSS
DIR  LT   TH   RT    LT TH RT      LT   TH   RT    WALK
EB    0 1014   42     0  2  0     0.0 15.0  0.0    33
WB    0 1155  602     0  3  2     0.0 11.0 15.0    58
NB    0    0  333     0  0  2     0.0  0.0 15.0    40
SB    0  742   65     0  3  1     0.0 12.0 15.0    35

TRAFFIC & ROADWAY CONDITIONS
                   ADJ PARK               PEDESTRIANS        ARR
DIR GRADE %HV   Y/N MOVES BUSES  PHF CROSS BUT MIN TIME TYPE
EB  0.0%  1.0%   Y      5     1  .900  253   Y    21.5    3
WB  0.0%  3.0%   Y      5     1  .820   82   Y    21.5    3
NB  0.0%  5.0%          0     0  .810  367   Y    17.0    3
SB  0.0%  3.0%   Y      5     1  .880   84   Y    17.0    3

PHASINGS
    EASTBOUND   WESTBOUND   NORTHBOUND  SOUTHBOUND GREEN  Y+R PRE/ACT
    l  t  r  p  l  t  r  p  l  t  r  p  l  t  r  p
 1                     *           *        *  *   28.0   3     A
 2     *  *                                        37.0   3     A
 3                  *  *                           26.0   3     A

CYCLE= 100.0

VOLUME ADJUSTMENT WORKSHEET
PART 1 (MOVEMENT ADJUSTMENTS)
DIR  LTV  THV  RTV   PHF  LTFR THFR RTFR
EB     0 1014   42  .900     0 1127   47
WB     0 1155  602  .820     0 1409  734
NB     0    0  333  .810     0    0  411
SB     0  742   65  .880     0  843   74

PART 2 (LANE GROUP ADJUSTMENTS)
DIR LN GROUP  FLOW N   LU    v  Plt  Prt
EB  TH-RT     1173 2 1.05 1232 0.00 0.04
WB  TH        1409 3 1.10 1549 0.00 0.00
WB  RT         734 2 1.05  771 0.00 1.00
NB  RT         411 2 1.05  432 0.00 1.00
SB  TH         843 3 1.10  928 0.00 0.00
SB  RT          74 1 1.00   74 0.00 1.00

PART 3 (OPPOSING VOLUME ADJUSTMENTS)
LEFT TURN                OPPOSING APPROACH
BEING OPPOSED        VOLUMES       % OPPOSING LEFT TURN    # LANES     OPPOSING
                   LT   TH   RT        LT   TH   RT        LT  TH  RT    VOLUME

SATURATION FLOW ADJUSTMENT WORKSHEET
DIR LN GROUP  IDEAL N  Fwid   Fhv   For Fpark  Fbus Farea   Frt   Flt    s
EB  TH-RT     1800  2 1.100 0.995 1.000 0.937 0.998 1.000 0.994 1.000 3663
WB  TH        1800  3 0.967 0.985 1.000 1.000 1.000 1.000 1.000 1.000 5143
WB  RT        1800  2 1.100 0.985 1.000 0.937 0.998 1.000 0.750 1.000 2737
NB  RT        1800  2 1.100 0.976 1.000 1.000 1.000 1.000 0.750 1.000 2898
SB  TH        1800  3 1.000 0.985 1.000 1.000 1.000 1.000 1.000 1.000 5320
SB  RT        1800  1 1.100 0.985 1.000 0.875 0.996 1.000 0.850 1.000 1444
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```
CAPACITY ANALYSIS WORKSHEET
DIR LN GROUP     v     s  v/s  g/C     c  v/c  CRITICAL
EB  TH-RT     1232 3663 0.34 0.37 1355 0.91      *
WB  TH        1549 5143 0.30 0.26 1337 1.16      *
WB  RT         771 2737 0.28 0.57 1560 0.49
NB  RT         432 2898 0.15 0.28  811 0.53
SB  TH         928 5320 0.17 0.28 1490 0.62      *
SB  RT          74 1444 0.05 0.28  404 0.18

CYCLE=100.0  LOST= 9.0  SUM V/S CRIT= 0.81 TOTAL V/C= 0.89

LEVEL OF SERVICE WORKSHEET
DIR LN GROUP  v/c  g/C   C     d1    c      d2   PF   Delay LOS Avg Q  95% Q
EB  TH-RT     0.91 0.37 100.0  22.72 1355    6.70 0.85   25.01  D  20.5   25
WB  TH        1.16 0.26 100.0  29.78 1337   82.78 0.85   95.67  F  51.9  113
WB  RT        0.49 0.57 100.0   9.78 1560    0.21 0.85    8.49  B   8.8    9
NB  RT        0.53 0.28 100.0  23.15  811    0.54 0.85   20.14  C   8.2    8
SB  TH        0.62 0.28 100.0  23.86 1490    0.59 0.85   20.78  C  16.9   17
SB  RT        0.18 0.28 100.0  20.76  404    0.03 0.85   17.67  C   1.5    2

DIR Delay LOS
EB  25.01  D
WB  66.71  F
NB  20.14  C
SB  20.55  C
INTERSECTION DELAY = 43.10 INTERSECTION LOS=E

THE CYCLE LENGTH WITHIN THE BOUNDS OF  100  TO  100 SECONDS
WHICH MINIMIZES CRITICAL MOVEMENT DELAY IS 100.0 SECONDS

FOR A V/C RATIO OF .95 THE CYCLE SHOULD BE  61.9 SECONDS
for chosen cycle length 100.0
suggested timing phase 1 is  19.5 secs green.   3.0 secs yellow + red clear
suggested timing phase 2 is  37.7 secs green.   3.0 secs yellow + red clear
suggested timing phase 3 is  33.8 secs green.   3.0 secs yellow + red clear
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CINCH PROGRAM VERSION DATE 4-29-1988
1985 HCM - CHAPTER 9: SIGNALIZED - OPERATIONAL ANALYSIS
BU SCHOOL MGMT
KENMORE SQUARE EXISTING PM
date:01-15-1993            time:08:13:12
LAST DATA SET NAMES LOADED OR SAVED
VOLUME=KESQEXPM   GEOMETRICS=KESQEXPM   SIGNAL=KESQEXPM
LOCATED IN CBD:N
VOLUME & GEOMETRICS
        VOLUMES      # OF LANES     LANE WIDTH     CROSS
DIR  LT   TH   RT    LT TH RT      LT   TH   RT    WALK
EB    0  595    0     0  2  0     0.0 15.0  0.0    33
WB    0 1361  700     0  3  2     0.0 11.0 15.0    58
NB    0    0  471     0  0  2     0.0  0.0 15.0    40
SB    0  824   44     0  3  1     0.0 12.0 15.0    35

TRAFFIC & ROADWAY CONDITIONS
                 ADJ PARK             PEDESTRIANS       ARR
DIR GRADE %HV   Y/N MOVES BUSES  PHF CROSS BUT MIN TIME TYPE
EB  0.0%  3.0%   Y     5     1  .860    0   Y     21.5    3
WB  0.0%  5.0%   Y     5     1  .880    0   Y     21.5    3
NB  0.0% 10.0%         0     0  .770    0   Y     17.0    3
SB  0.0%  6.0%   Y     5     1  .750    0   Y     17.0    3

PHASINGS
    EASTBOUND   WESTBOUND   NORTHBOUND  SOUTHBOUND GREEN  Y+R PRE/ACT
    l  t  r  p  l  t  r  p  l  t  r  p  l  t  r  p
 1                    *           *        *  *     35.0    3    A
 2     *  *           *                             24.0    3    A
 3                 *  *                             42.0    3    A

CYCLE= 110.0

VOLUME ADJUSTMENT WORKSHEET
PART 1 (MOVEMENT ADJUSTMENTS)
DIR  LTV  THV  RTV   PHF  LTFR THFR RTFR
EB     0  595    0  .860     0  692    0
WB     0 1361  700  .880     0 1547  795
NB     0    0  471  .770     0    0  612
SB     0  824   44  .750     0 1099   59

PART 2 (LANE GROUP ADJUSTMENTS)
DIR LN GROUP  FLOW N   LU    v  Plt  Prt
EB  TH         692 2 1.05  726 0.00 0.00
WB  TH        1547 3 1.10 1701 0.00 0.00
WB  RT         795 2 1.05  835 0.00 1.00
NB  RT         612 2 1.05  642 0.00 1.00
SB  TH        1099 3 1.10 1209 0.00 0.00
SB  RT          59 1 1.00   59 0.00 1.00

PART 3 (OPPOSING VOLUME ADJUSTMENTS)
LEFT TURN                OPPOSING APPROACH
BEING OPPOSED       VOLUMES      % OPPOSING LEFT TURN    # LANES     OPPOSING
                 LT    TH    RT        LT    TH    RT       LT  TH  RT    VOLUME

SATURATION FLOW ADJUSTMENT WORKSHEET
DIR LN GROUP   IDEAL N  Fwid   Fhv   For Fpark  Fbus Farea   Frt   Flt    s
EB  TH          1800  2 1.100 0.985 1.000 0.937 0.998 1.000 1.000 1.000 3649
WB  TH          1800  3 0.967 0.976 1.000 1.000 1.000 1.000 1.000 1.000 5093
WB  RT          1800  2 1.100 0.976 1.000 0.937 0.998 1.000 0.750 1.000 2710
NB  RT          1800  2 1.100 0.952 1.000 1.000 1.000 1.000 0.750 1.000 2829
SB  TH          1800  3 1.000 0.971 1.000 1.000 1.000 1.000 1.000 1.000 5243
SB  RT          1800  1 1.100 0.971 1.000 0.875 0.996 1.000 0.850 1.000 1423
```

```
CAPACITY ANALYSIS WORKSHEET
DIR LN GROUP     v     s  v/s  g/C     c  v/c  CRITICAL
EB  TH         726 3649 0.20 0.22  796 0.91     *
WB  TH        1701 5093 0.33 0.38 1944 0.87     *
WB  RT         835 2710 0.31 1.00 2710 0.31
NB  RT         642 2829 0.23 0.32  900 0.71
SB  TH        1209 5243 0.23 0.32 1668 0.72     *
SB  RT          59 1423 0.04 0.32  453 0.13

CYCLE=110.0  LOST= 9.0  SUM V/S CRIT= 0.76 TOTAL V/C= 0.83

LEVEL OF SERVICE WORKSHEET
DIR LN GROUP  v/c  g/C   C      d1    c       d2   PF    Delay LOS Avg Q  95% Q
EB  TH        0.91 0.22 110.0  31.90  796    10.62 0.85   36.14  D  16.5    22
WB  TH        0.87 0.38 110.0  23.99 1944     3.45 0.85   23.32  C  29.2    31
WB  RT        0.31 1.00 110.0   0.00 2710     0.02 0.85    0.02  A   0.0     1
NB  RT        0.71 0.32 110.0  25.14  900     1.88 0.85   22.97  C  12.7    13
SB  TH        0.72 0.32 110.0  25.25 1668     1.12 0.85   22.42  C  22.9    23
SB  RT        0.13 0.32 110.0  20.27  453     0.01 0.85   17.23  C   1.2     1

DIR Delay LOS
EB  36.14  D
WB  15.65  C
NB  22.97  C
SB  22.18  C
INTERSECTION DELAY = 21.03 INTERSECTION LOS=C

THE CYCLE LENGTH WITHIN THE BOUNDS OF  110  TO  110 SECONDS
WHICH MINIMIZES CRITICAL MOVEMENT DELAY IS 110.0 SECONDS

FOR A V/C RATIO OF .95 THE CYCLE SHOULD BE  45.9 SECONDS
for chosen cycle length 110.0
suggested timing phase 1 is  30.5 secs green.   3.0 secs yellow + red clear
suggested timing phase 2 is  26.3 secs green.   3.0 secs yellow + red clear
suggested timing phase 3 is  44.2 secs green.   3.0 secs yellow + red clear
```

```
CINCH PROGRAM VERSION DATE 4-29-1988
1985 HCM - CHAPTER 9: SIGNALIZED - OPERATIONAL ANALYSIS
BU SCHOOL MGMT
KENMORE SQUARE 1997 PM NO-BUILD
date:01-28-1993            time:15:00:24
LAST DATA SET NAMES LOADED OR SAVED
VOLUME=KESQNBPM   GEOMETRICS=KESQNBPM   SIGNAL=KESQNBPM
LOCATED IN CBD:N
VOLUME & GEOMETRICS
        VOLUMES      # OF LANES     LANE WIDTH     CROSS
DIR  LT   TH   RT    LT TH RT     LT   TH   RT     WALK
EB    0  610    0     0  2  0    0.0 15.0  0.0     33
WB    0 1404  734     0  3  2    0.0 11.0 15.0     58
NB    0    0  578     0  0  2    0.0  0.0 15.0     40
SB    0  883   44     0  3  1    0.0 12.0 15.0     35

TRAFFIC & ROADWAY CONDITIONS
                 ADJ PARK              PEDESTRIANS        ARR
DIR GRADE %HV   Y/N MOVES BUSES  PHF CROSS BUT MIN TIME TYPE
EB  0.0%  3.0%   Y     5     1  .860    0   Y    21.5    3
WB  0.0%  5.0%   Y     5     1  .880    0   Y    21.5    3
NB  0.0% 10.0%         0     0  .770    0   Y    17.0    3
SB  0.0%  6.0%   Y     5     1  .750    0   Y    17.0    3

PHASINGS
    EASTBOUND   WESTBOUND   NORTHBOUND  SOUTHBOUND GREEN  Y+R PRE/ACT
    l  t  r  p  l  t  r  p  l  t  r  p  l  t  r  p
 1                    *           *        *  *     35.0   3    A
 2     *  *           *                             24.0   3    A
 3                 *  *                             42.0   3    A

CYCLE= 110.0

VOLUME ADJUSTMENT WORKSHEET
PART 1 (MOVEMENT ADJUSTMENTS)
DIR  LTV  THV  RTV   PHF  LTFR THFR RTFR
EB     0  610    0  .860     0  709    0
WB     0 1404  734  .880     0 1595  834
NB     0    0  578  .770     0    0  751
SB     0  883   44  .750     0 1177   59

PART 2 (LANE GROUP ADJUSTMENTS)
DIR LN GROUP  FLOW N   LU    v  Plt  Prt
EB  TH         709 2 1.05  745 0.00 0.00
WB  TH        1595 3 1.10 1755 0.00 0.00
WB  RT         834 2 1.05  876 0.00 1.00
NB  RT         751 2 1.05  788 0.00 1.00
SB  TH        1177 3 1.10 1295 0.00 0.00
SB  RT          59 1 1.00   59 0.00 1.00

PART 3 (OPPOSING VOLUME ADJUSTMENTS)
LEFT TURN                 OPPOSING APPROACH
BEING OPPOSED       VOLUMES       % OPPOSING LEFT TURN     # LANES     OPPOSING
                 LT    TH    RT        LT    TH    RT       LT  TH  RT    VOLUME

SATURATION FLOW ADJUSTMENT WORKSHEET
DIR LN GROUP  IDEAL N  Fwid   Fhv    For Fpark  Fbus Farea   Frt   Flt    s
EB  TH         1800  2 1.100 0.985 1.000 0.937 0.998 1.000 1.000 1.000 3649
WB  TH         1800  3 0.967 0.976 1.000 1.000 1.000 1.000 1.000 1.000 5093
WB  RT         1800  2 1.100 0.976 1.000 0.937 0.998 1.000 0.750 1.000 2710
NB  RT         1800  2 1.100 0.952 1.000 1.000 1.000 1.000 0.750 1.000 2829
SB  TH         1800  3 1.000 0.971 1.000 1.000 1.000 1.000 1.000 1.000 5243
SB  RT         1800  1 1.100 0.971 1.000 0.875 0.996 1.000 0.850 1.000 1423
```

```
CAPACITY ANALYSIS WORKSHEET
DIR LN GROUP     v    s  v/s  g/C    c  v/c  CRITICAL
EB  TH         745 3649 0.20 0.22  796 0.94     *
WB  TH        1755 5093 0.34 0.38 1944 0.90     *
WB  RT         876 2710 0.32 1.00 2710 0.32
NB  RT         788 2829 0.28 0.32  900 0.88     *
SB  TH        1295 5243 0.25 0.32 1668 0.78
SB  RT          59 1423 0.04 0.32  453 0.13

CYCLE=110.0  LOST= 9.0  SUM V/S CRIT= 0.83 TOTAL V/C= 0.90

LEVEL OF SERVICE WORKSHEET
DIR LN GROUP  v/c  g/C   C     d1    c      d2   PF   Delay LOS Avg Q  95% Q
EB  TH        0.94 0.22 110.0  32.10  796   13.17 0.85   38.48  D  16.9   24
WB  TH        0.90 0.38 110.0  24.37 1944    4.60 0.85   24.63  C  30.1   34
WB  RT        0.32 1.00 110.0   0.00 2710    0.03 0.85    0.02  A   0.0    1
NB  RT        0.88 0.32 110.0  26.94  900    6.88 0.85   28.74  D  15.6   19
SB  TH        0.78 0.32 110.0  25.81 1668    1.68 0.85   23.36  C  24.5   25
SB  RT        0.13 0.32 110.0  20.27  453    0.01 0.85   17.23  C   1.2    1

DIR Delay LOS
EB  38.48  D
WB  16.44  C
NB  28.74  D
SB  23.09  C
INTERSECTION DELAY = 22.80 INTERSECTION LOS=C

THE CYCLE LENGTH WITHIN THE BOUNDS OF  110  TO  110 SECONDS
WHICH MINIMIZES CRITICAL MOVEMENT DELAY IS 110.0 SECONDS

FOR A V/C RATIO OF .95 THE CYCLE SHOULD BE  69.7 SECONDS
for chosen cycle length 110.0
suggested timing phase 1 is  34.0 secs green.   3.0 secs yellow + red clear
suggested timing phase 2 is  24.9 secs green.   3.0 secs yellow + red clear
suggested timing phase 3 is  42.1 secs green.   3.0 secs yellow + red clear
```

```
CINCH PROGRAM VERSION DATE 4-29-1988
1985 HCM - CHAPTER 9: SIGNALIZED - OPERATIONAL ANALYSIS
BU SCHOOL MGMT
KENMORE SQUARE 1997 PM BUILD
date:01-15-1993              time:13:52:11
LAST DATA SET NAMES LOADED OR SAVED
VOLUME=KESQBPM    GEOMETRICS=KESQBPM    SIGNAL=KESQBPM
LOCATED IN CBD:N
VOLUME & GEOMETRICS
      VOLUMES       # OF LANES     LANE WIDTH      CROSS
DIR  LT   TH   RT    LT TH RT      LT   TH   RT    WALK
EB    0  610    0     0  2  0     0.0 15.0  0.0    33
WB    0 1404  734     0  3  2     0.0 11.0 15.0    58
NB    0    0  578     0  0  2     0.0  0.0 15.0    40
SB    0  906   44     0  3  1     0.0 12.0 15.0    35

TRAFFIC & ROADWAY CONDITIONS
             ADJ PARK               PEDESTRIANS       ARR
DIR GRADE %HV   Y/N MOVES BUSES  PHF CROSS BUT MIN TIME TYPE
EB  0.0%  3.0%   Y     5     1   .860    0   Y     21.5    3
WB  0.0%  5.0%   Y     5     1   .880    0   Y     21.5    3
NB  0.0% 10.0%         0     0   .770    0   Y     17.0    3
SB  0.0%  6.0%   Y     5     1   .750    0   Y     17.0    3

PHASINGS
   EASTBOUND   WESTBOUND   NORTHBOUND  SOUTHBOUND GREEN  Y+R PRE/ACT
   l t r p l t r p l t r p l t r p
 1             *       *     * *     35.0   3    A
 2   * *       *                     24.0   3    A
 3           * *                     42.0   3    A

CYCLE= 110.0

VOLUME ADJUSTMENT WORKSHEET
PART 1 (MOVEMENT ADJUSTMENTS)
DIR  LTV  THV  RTV   PHF  LTFR THFR RTFR
EB     0  610    0  .860     0  709    0
WB     0 1404  734  .880     0 1595  834
NB     0    0  578  .770     0    0  751
SB     0  906   44  .750     0 1208   59

PART 2 (LANE GROUP ADJUSTMENTS)
DIR LN GROUP  FLOW N   LU     v  Plt  Prt
EB  TH         709 2 1.05  745 0.00 0.00
WB  TH        1595 3 1.10 1755 0.00 0.00
WB  RT         834 2 1.05  876 0.00 1.00
NB  RT         751 2 1.05  788 0.00 1.00
SB  TH        1208 3 1.10 1329 0.00 0.00
SB  RT          59 1 1.00   59 0.00 1.00

PART 3 (OPPOSING VOLUME ADJUSTMENTS)
LEFT TURN               OPPOSING APPROACH
BEING OPPOSED        VOLUMES       % OPPOSING LEFT TURN     # LANES      OPPOSING
             LT   TH   RT          LT   TH   RT          LT  TH  RT     VOLUME

SATURATION FLOW ADJUSTMENT WORKSHEET
DIR LN GROUP  IDEAL N  Fwid   Fhv   For Fpark  Fbus Farea   Frt   Flt     s
EB  TH         1800  2 1.100 0.985 1.000 0.937 0.998 1.000 1.000 1.000 3649
WB  TH         1800  3 0.967 0.976 1.000 1.000 1.000 1.000 1.000 1.000 5093
WB  RT         1800  2 1.100 0.976 1.000 0.937 0.998 1.000 0.750 1.000 2710
NB  RT         1800  2 1.100 0.952 1.000 1.000 1.000 1.000 0.750 1.000 2829
SB  TH         1800  3 1.000 0.971 1.000 1.000 1.000 1.000 1.000 1.000 5243
SB  RT         1800  1 1.100 0.971 1.000 0.875 0.996 1.000 0.850 1.000 1423
```

```
CAPACITY ANALYSIS WORKSHEET
DIR LN GROUP     v     s  v/s  g/C     c  v/c  CRITICAL
EB  TH         745 3649 0.20 0.22  796 0.94      *
WB  TH        1755 5093 0.34 0.38 1944 0.90      *
WB  RT         876 2710 0.32 1.00 2710 0.32
NB  RT         788 2829 0.28 0.32  900 0.88      *
SB  TH        1329 5243 0.25 0.32 1668 0.80
SB  RT          59 1423 0.04 0.32  453 0.13

CYCLE=110.0  LOST= 9.0  SUM V/S CRIT= 0.83 TOTAL V/C= 0.90

LEVEL OF SERVICE WORKSHEET
DIR LN GROUP  v/c  g/C   C      d1    c      d2   PF    Delay LOS Avg Q  95% Q
EB  TH        0.94 0.22 110.0  32.10  796   13.17 0.85   38.48  D  16.9    24
WB  TH        0.90 0.38 110.0  24.37 1944    4.60 0.85   24.63  C  30.1    34
WB  RT        0.32 1.00 110.0   0.00 2710    0.03 0.85    0.02  A   0.0     1
NB  RT        0.88 0.32 110.0  26.94  900    6.88 0.85   28.74  D  15.6    19
SB  TH        0.80 0.32 110.0  26.03 1668    1.97 0.85   23.80  C  25.2    25
SB  RT        0.13 0.32 110.0  20.27  453    0.01 0.85   17.23  C   1.2     1

DIR Delay LOS
EB  38.48  D
WB  16.44  C
NB  28.74  D
SB  23.53  C
INTERSECTION DELAY = 22.91 INTERSECTION LOS=C

THE CYCLE LENGTH WITHIN THE BOUNDS OF  110  TO  110 SECONDS
WHICH MINIMIZES CRITICAL MOVEMENT DELAY IS 110.0 SECONDS

FOR A V/C RATIO OF .95 THE CYCLE SHOULD BE  69.7 SECONDS
for chosen cycle length 110.0
suggested timing phase 1 is  34.0 secs green.   3.0 secs yellow + red clear
suggested timing phase 2 is  24.9 secs green.   3.0 secs yellow + red clear
suggested timing phase 3 is  42.1 secs green.   3.0 secs yellow + red clear
```

TRIP GENERATION ESTIMATES

VHB

Trip Generation Estimates

3244.12

Boston University
School of Management

Typical Wednesday	Total Classes	Avg Size	Total Students		Person Trips per Day	Percent by Car	Vehicle Trips/Day
Undergraduate Students	18	60	1080		2200	23%	506
Graduate Students	18	25	450		900	73%	657
	Total	Att. Factor	No. Present	Non-Work			
Administrative Employees	252	0.9	227	129	700	66%	462
SMG Employees	145	0.9	131	74	400	66%	264
Full-Time Faculty	112	0.34	38	0	76	77%	59
Part-Time Faculty	81	0.34	28	0	56	77%	43
PhD Students	70	0.5	35	0	70	77%	54
Subtotal					**200**		**156**
Executive Training	80	NA	80	0	160	50%	80
Total Trips per Day					**4560**		**2125**
Special Events							
Trustee Meetings	75	NA	NA	0	125	100%	125
Full Capacity Exec. Training	240	NA	240	0	480	50%	240

Source: BU Office of Space Management (Building per day utilization)

Percent by car from BU Campus Parking Study (1986) for students, faculty, and staff

Percent by car for exec. training and trustees are VHB extimates

Person trip totals are rounded to the nearest 100 (except exec. training and trustees; rounded to the nearest 5)

Employee non-work trips represent 56.7% of work trips

For trustee meetings it is assumed that 12 attendees work in the building

Appendix E Wind

APPENDIX E1

WIND TUNNEL SIMULATION OF THE ATMOSPHERIC BOUNDARY LAYER

In the lowest layer of the atmosphere the wind is slowed down by the drag effect of the numerous features on the earth's surface such as vegetation, the ground roughness and man-made structures. Within this atmospheric boundary layer the mean wind speed generally increases with height until the top of the layer is reached, at which point surface drag no longer plays a role. The mean speed implies an average speed over a period of about one hour. The height of the boundary layer is variable but, at least in strong winds, the best estimate from Counihan[1] and Snyder[2] is that the height is approximately 600m (i.e. ~ 2000 ft).

In wind tunnel tests, it is important to simulate the mean wind speed profile, the wind's turbulence intensity and the length scale of turbulence within the atmospheric boundary layer. Figure 1 shows one of the boundary layer wind tunnels at the Guelph, Ontario laboratory of Rowan Williams Davies & Irwin Inc. The model to be tested is mounted near the centre of the 2.4m (8 ft) diameter turntable, 13m (42 ft) downwind of the entrance to the working section. All major features and structures within the radius covered by the turntable are modelled in detail thereby assuring their effect on the wind flows around the site being studied is accurately simulated. Upstream of the turntable the terrain roughness is modelled by generalized roughness distributed over the working section's floor. In addition, specially designed turbulence generators are installed at the start of the working section. By varying the floor roughness and turbulence generators the effects of various types of terrain roughness upwind of the turntable can be reproduced at model scale. A detailed explanation of these techniques is provided by Irwin[3].

In strong winds, the mean speed profile in the atmospheric boundary layer is found to be well represented by the power law expression:

$$U = U_G \left(\frac{Z}{Z_G}\right)^{\alpha}$$

---

[1] **Counihan, J.** Adiabatic Atmospheric Boundary Layer: A Review of Data from the Period 1880-1972, Atmospheric Environment, Vol. 9, No. 10, pp. 871-905, 1975.

[2] **Snyder, W. H.,** Guideline for Fluid Modelling of Atmospheric Diffusion, US-EPA, Report 600/8-81-009, 1981.

[3] **Irwin, P. A.,** Design and Use of Spires for Natural Wind Simulation, National Research Council of Canada, N.A.E. Report LTR-LA-233, 1979.

where

U = mean wind speed

U_G = gradient wind speed (i.e. value of **U** at the top of the boundary layer)

Z = height above zero plane displacement height, **d**

Z_G = depth of boundary layer, usually taken as 600m

α = constant

Note that the vertical height, **Z**, is referenced from the zero plane displacement height, **d**. The value of **d** may be accurately determined from Simiu and Scanlan[4]. A representative value of **d** for urban terrain is 20m (66 ft). For open and suburban terrains, **d** is insignificant.

The exponent, α varies with terrain roughness. The following are representative values:

Type of Terrain	α
Open country with some vegetation	0.14
Suburban areas	0.25
Heavily built city cores	0.33

RWDI has undertaken extensive calibration measurements to ensure these profiles are well matched in the wind tunnel. Figure 2 shows the locations of the measurements. All measurements were taken on the wind tunnel centreline. Figure 3 shows wind speed profiles generated and compares them with the above power law expression. The wind tunnel speed profile can be seen to follow the power law relation well for each type of the boundary layer.

The wind turbulence intensity may be quantified by defining it as the ratio u'/U where u' = root-mean-square of the velocity fluctuations in the direction of the mean wind velocity. The turbulence intensity increases as the terrain roughness increases and is generally greater near the ground. Figure 4 shows the measured turbulence intensities for each of the simulated atmospheric boundary layers described above. Curves representative of full scale data[1] have been included for comparison. Agreement with these curves again indicates a good representation of full scale.

---

[4] Simiu, E. and Scanlan, R.H. Wind Effects on Structures, John Wiley and Sons, NY, 1978.

It is also important to ensure that the length scale of turbulence eddies is correctly simulated. This can be assured by having the longitudinal integral scale of the turbulence correct in relation to the model scale, (e.g. for a 1:400 scale model the longitudinal integral scale, L, on the model should be 1/400th of the full scale value). It is found that by scaling the boundary layer height down by the desired model scale ratio, the measured integral scales in the wind tunnel are in the right range compared with full scale values[5] (e.g. at a height of 100m, the model values scale up to L values in the range of 150m to 500m depending on the terrain).

---

[5] **Engineering Sciences** Characteristics of Atmospheric Turbulence Data Unit Near the Ground: Part III, Variations in Space and Time for Strong Winds, Engineering Sciences Data Item Number 750001, London, England, 1975.

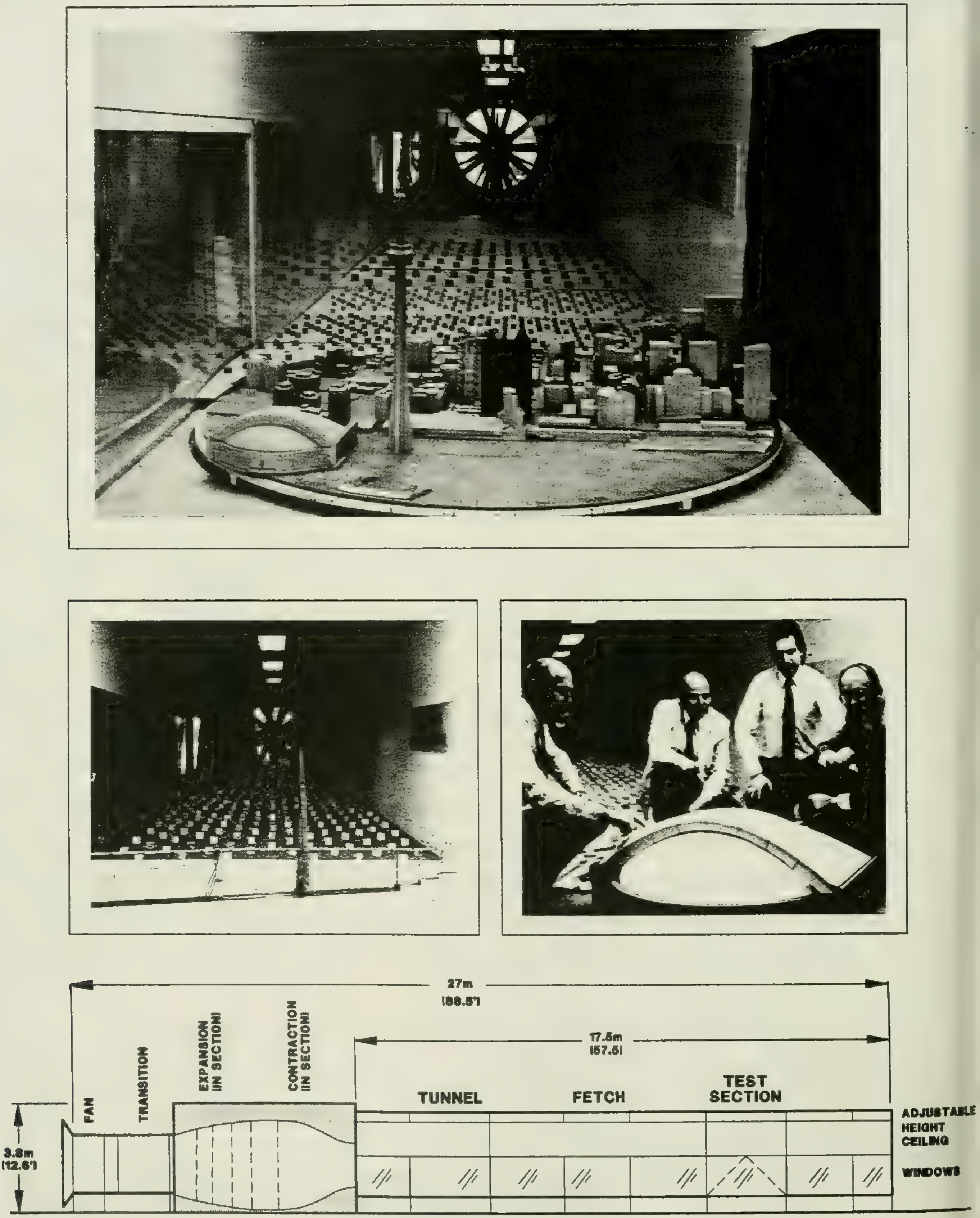


Figure 1: 1.9 m x 2.4 m Boundary Layer Wind Tunnel Facility

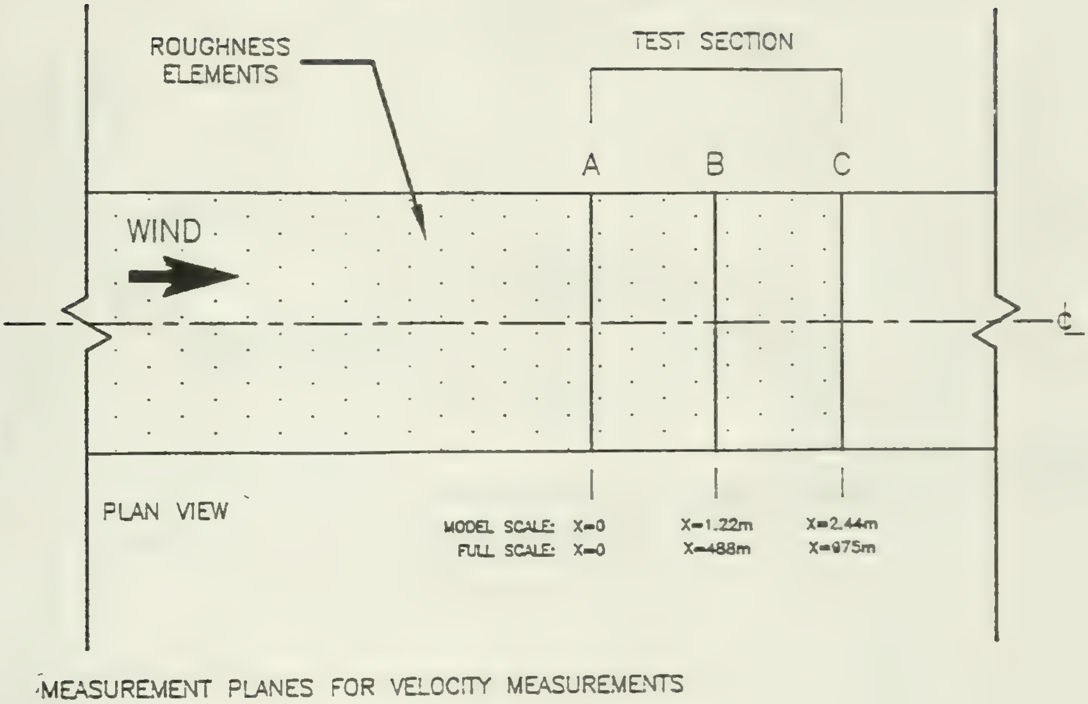


Figure 2: Location of Velocity Profiles

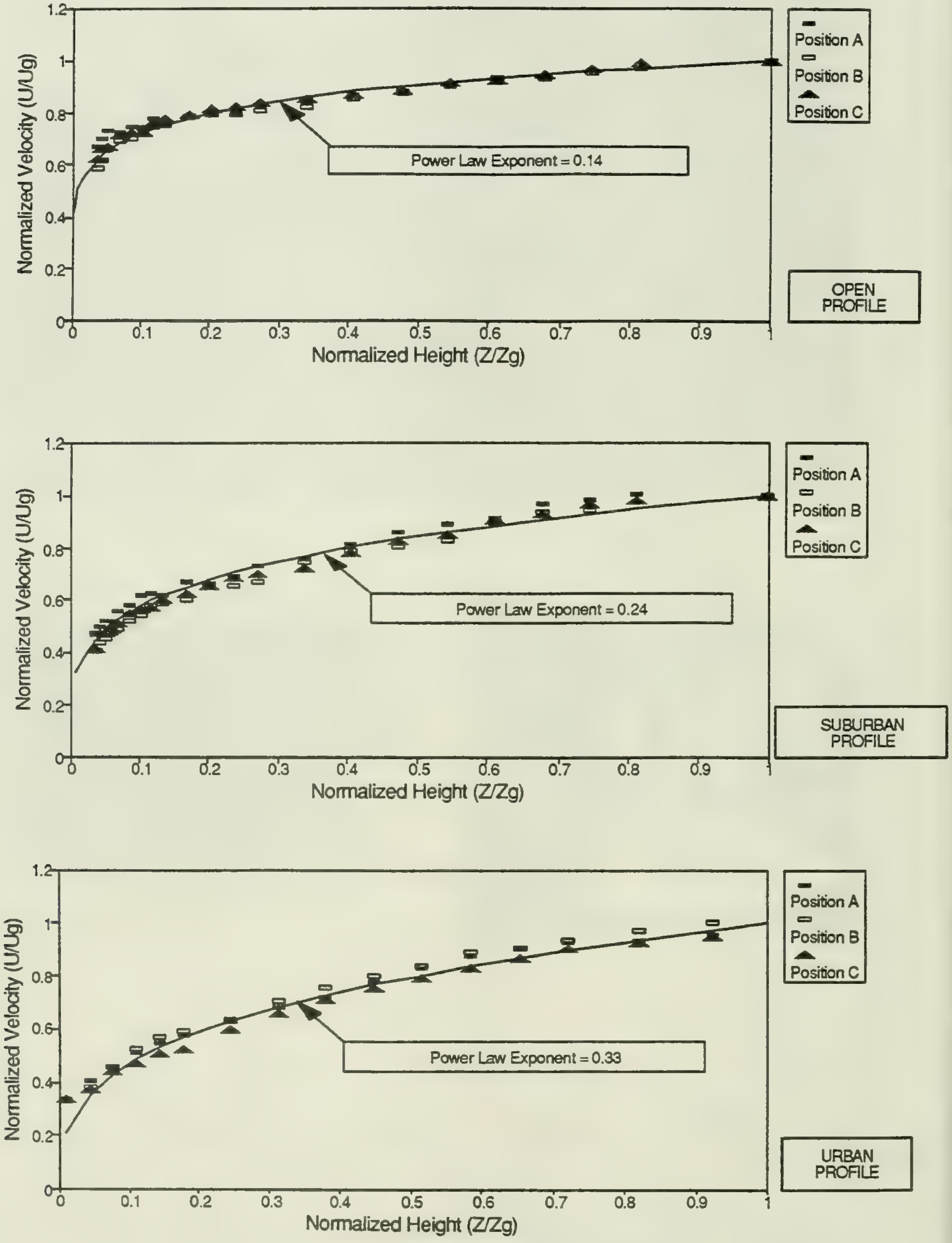


Figure 3: Simulated Mean Wind Profile

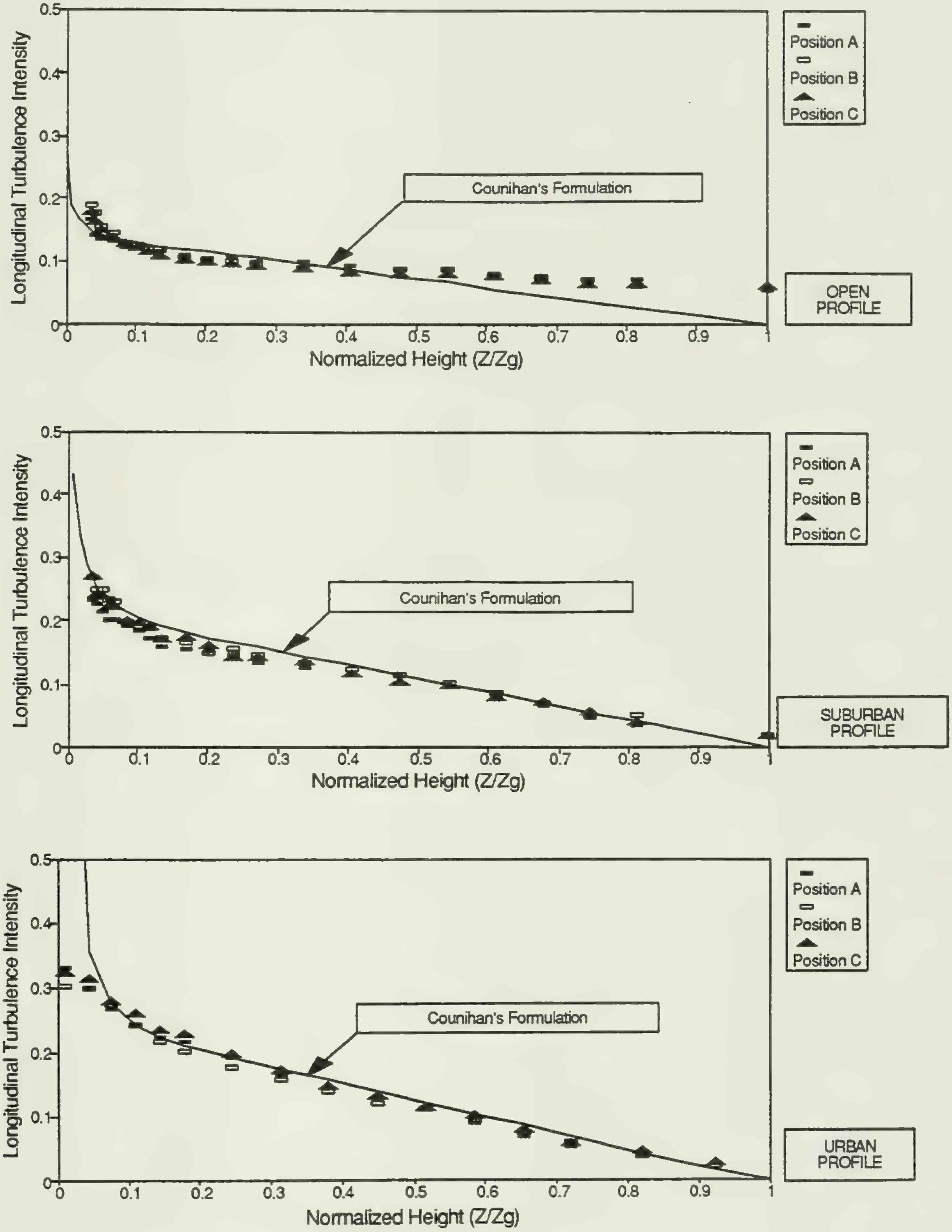


Figure 4: Simulated Full Scale Longitudinal Turbulence Intensity Profiles

APPENDIX E2

SUGGESTED MEAN WIND SPEEDS FOR --------> (MPH)

SITTING	12	STANDING	15	WALKING	19	UNCOMFORTABLE FOR WALKING	27	DANGEROUS CONDITIONS

Scale (MPH): 10 : 15 : 20 : 25 : 29+ :

LOCATION	TEST CONDITION	PERCENTAGE CHANGE	MEAN SPEED (MPH)
1	A		19
	B	- 15	16
2	A		18
	B		17
3	A		23
	B	- 30	16
4	A		15
	B	- 13	13
5	A		24
	B	- 54	11
6	A		21
	B	- 52	10
7	A		15
	B		14
8	A		12
	B	+ 33	16
9	A		16
	B	- 18	13
10	A		15
	B		15
11	A		17
	B		17
12	A		17
	B		18
13	A		15
	B		14
14	A		15
	B		14
15	A		13
	B		13
16	A		17
	B		16

NOTE: 1) Final asterisk denotes category of pedestrian activity for which the predicted winds are suitable.
2) % Change greater than 10% based on comparison with Test Condition A.
3) Wind speeds are for a 1% probability.

TEST CONDITION

A	NO-BUILD CONDITION
B	BUILD CONDITION

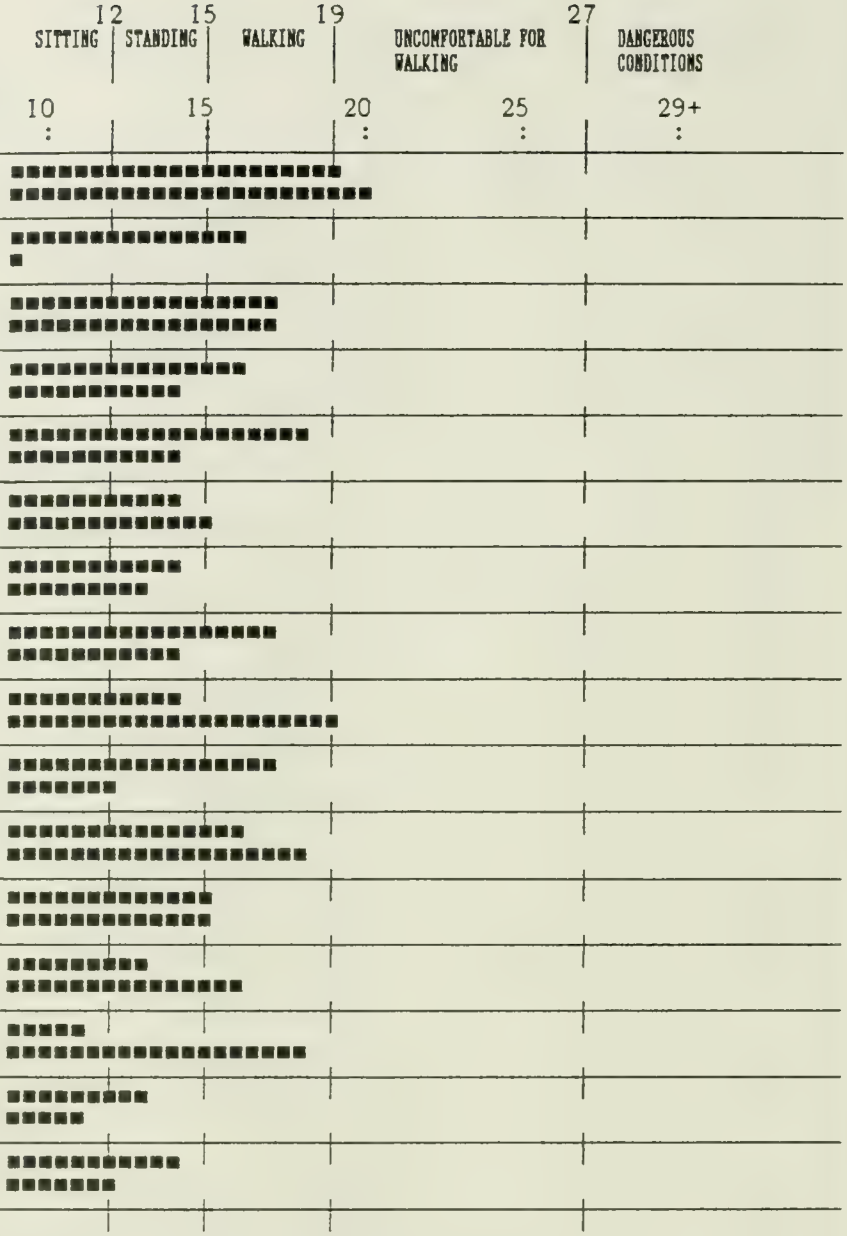
APPENDIX E2 TABLE 1

ANTICIPATED LEVELS OF PEDESTRIAN WIND COMFORT

SPRING

SUGGESTED MEAN WIND SPEEDS FOR --------> (MPH)

LOCATION	TEST CONDITION	PERCENTAGE CHANGE	MEAN SPEED (MPH)
17	A		19
	B		20
18	A		16
	B	- 43	9
19	A		17
	B		17
20	A		16
	B	- 12	14
21	A		18
	B	- 22	14
22	A		14
	B		15
23	A		14
	B		13
24	A		17
	B	- 17	14
25	A		14
	B	+ 35	19
26	A		17
	B	- 29	12
27	A		16
	B	+ 12	18
28	A		15
	B		15
29	A		13
	B	+ 23	16
30	A		11
	B	+ 63	18
31	A		13
	B	- 15	11
32	A		14
	B	- 14	12



NOTE: 1) Final asterisk denotes category of pedestrian activity for which the predicted winds are suitable.
2) % Change greater than 10% based on comparison with Test Condition A.
3) Wind speeds are for a 1% probability.

TEST CONDITION

A	NO-BUILD CONDITION
B	BUILD CONDITION

APPENDIX E2 TABLE 2

ANTICIPATED LEVELS OF PEDESTRIAN WIND COMFORT

SPRING

SUGGESTED MEAN WIND SPEEDS FOR -------->		(MPH)		SITTING 12	STANDING 15	WALKING 19	UNCOMFORTABLE FOR WALKING 27	DANGEROUS CONDITIONS
LOCATION	TEST CONDITION	PERCENTAGE CHANGE	MEAN SPEED (MPH)	10 :	15	20 :	25 :	29+ :
33	A		**	NOT TESTED				
	B		19	■■■■■■■■■■■■■■■■■■■■■				
34	A		**	NOT TESTED				
	B		19	■■■■■■■■■■■■■■■■■■■■■				

NOTE: 1) Final asterisk denotes category of pedestrian activity for which the predicted winds are suitable.
2) % Change greater than 10% based on comparison with Test Condition A.
3) Wind speeds are for a 1% probability.

TEST CONDITION

A	NO-BUILD CONDITION
B	BUILD CONDITION

APPENDIX E2 TABLE 3

ANTICIPATED LEVELS OF PEDESTRIAN WIND COMFORT

SPRING

SUGGESTED MEAN WIND SPEEDS FOR -------->	(MPH)			12 SITTING | 15 STANDING | 19 WALKING | 27 UNCOMFORTABLE FOR WALKING | DANGEROUS CONDITIONS
LOCATION	TEST CONDITION	PERCENTAGE CHANGE	MEAN SPEED (MPH)	10 : 15 20 : 25 : 29+ :
1	A		15	■■■■■■■■■■■■■
	B	- 20	12	■■■■■■■
2	A		15	■■■■■■■■■■■■■
	B		14	■■■■■■■■■■■
3	A		17	■■■■■■■■■■■■■■■■■
	B	- 29	12	■■■■■■■
4	A		12	■■■■■■■
	B		11	■■■■■
5	A		17	■■■■■■■■■■■■■■■■■
	B	- 47	9	■
6	A		15	■■■■■■■■■■■■■
	B	- 46	8	<
7	A		13	■■■■■■■■■
	B		13	■■■■■■■■■
8	A		10	■■■
	B	+ 30	13	■■■■■■■■■
9	A		13	■■■■■■■■■
	B		12	■■■■■■■
10	A		12	■■■■■■■
	B		13	■■■■■■■■■
11	A		13	■■■■■■■■■
	B		13	■■■■■■■■■
12	A		13	■■■■■■■■■
	B		14	■■■■■■■■■■■
13	A		13	■■■■■■■■■
	B		12	■■■■■■■
14	A		12	■■■■■■■
	B		11	■■■■■
15	A		10	■■■
	B		10	■■■
16	A		13	■■■■■■■■■
	B		13	■■■■■■■■■

NOTE: 1) Final asterisk denotes category of pedestrian activity for which the predicted winds are suitable.
2) % Change greater than 10% based on comparison with Test Condition A.
3) Wind speeds are for a 1% probability.

TEST CONDITION

A	NO-BUILD CONDITION
B	BUILD CONDITION

APPENDIX E2 TABLE 4

ANTICIPATED LEVELS OF PEDESTRIAN WIND COMFORT

SUMMER

SUGGESTED MEAN WIND SPEEDS FOR -------->		(MPH)		12 SITTING | 15 STANDING | 19 WALKING | 27 UNCOMFORTABLE FOR WALKING | DANGEROUS CONDITIONS
LOCATION	TEST CONDITION	PERCENTAGE CHANGE	MEAN SPEED (MPH)	10 : 15 20 : 25 : 29+ :
17	A		14	■■■■■■■■■■■
	B	+ 14	16	■■■■■■■■■■■■■■■
18	A		13	■■■■■■■■■
	B	- 46	7	<
19	A		13	■■■■■■■■■
	B		14	■■■■■■■■■■■
20	A		12	■■■■■■■
	B		12	■■■■■■■
21	A		14	■■■■■■■■■■■
	B	- 21	11	■■■■■
22	A		11	■■■■■
	B	+ 18	13	■■■■■■■■■
23	A		11	■■■■■
	B		10	■■■
24	A		16	■■■■■■■■■■■■■■■
	B	- 18	13	■■■■■■■■■
25	A		11	■■■■■
	B	+ 18	13	■■■■■■■■■
26	A		15	■■■■■■■■■■■■■
	B	- 33	10	■■■
27	A		13	■■■■■■■■■
	B		14	■■■■■■■■■■■
28	A		13	■■■■■■■■■
	B		12	■■■■■■■
29	A		11	■■■■■
	B		12	■■■■■■■
30	A		9	■
	B	+ 55	14	■■■■■■■■■■■
31	A		10	■■■
	B	- 20	8	<
32	A		10	■■■
	B		10	■■■

NOTE: 1) Final asterisk denotes category of pedestrian activity for which the predicted winds are suitable.
2) % Change greater than 10% based on comparison with Test Condition A.
3) Wind speeds are for a 1% probability.

TEST CONDITION

A	NO-BUILD CONDITION
B	BUILD CONDITION

APPENDIX E2 TABLE 5

ANTICIPATED LEVELS OF PEDESTRIAN WIND COMFORT

SUMMER

SUGGESTED MEAN (MPH) WIND SPEEDS FOR -------->				SITTING	12 STANDING	15 WALKING	19 UNCOMFORTABLE FOR WALKING	27 DANGEROUS CONDITIONS
LOCATION	TEST CONDITION	PERCENTAGE CHANGE	MEAN SPEED (MPH)	10 :	15	20 :	25 :	29+ :
33	A		**	NOT TESTED				
	B		15	■■■■■■■■■■■■■				
34	A		**	NOT TESTED				
	B		15	■■■■■■■■■■■■■				

NOTE: 1) Final asterisk denotes category of pedestrian activity for which the predicted winds are suitable.
2) % Change greater than 10% based on comparison with Test Condition A.
3) Wind speeds are for a 1% probability.

TEST CONDITION

A	NO-BUILD CONDITION
B	BUILD CONDITION

APPENDIX E2 TABLE 6

ANTICIPATED LEVELS OF PEDESTRIAN WIND COMFORT

SUMMER

SUGGESTED MEAN (MPH)
WIND SPEEDS FOR -------->

	12	15	19	27	
SITTING	| STANDING	| WALKING	| UNCOMFORTABLE FOR WALKING	| DANGEROUS CONDITIONS	

LOCATION	TEST CONDITION	PERCENTAGE CHANGE	MEAN SPEED (MPH)	10 : 15 20 : 25 : 29+ :
1	A		18	■■■■■■■■■■■■■■■■■■■
	B	- 16	15	■■■■■■■■■■■■■
2	A		18	■■■■■■■■■■■■■■■■■■■
	B	- 11	16	■■■■■■■■■■■■■■■
3	A		21	■■■■■■■■■■■■■■■■■■■■■■■■■
	B	- 28	15	■■■■■■■■■■■■■
4	A		14	■■■■■■■■■■■
	B		13	■■■■■■■■■
5	A		22	■■■■■■■■■■■■■■■■■■■■■■■■■■■
	B	- 50	11	■■■■■
6	A		19	■■■■■■■■■■■■■■■■■■■■■
	B	- 47	10	■■■
7	A		15	■■■■■■■■■■■■■
	B	- 13	13	■■■■■■■■■
8	A		12	■■■■■■■
	B	+ 25	15	■■■■■■■■■■■■■
9	A		16	■■■■■■■■■■■■■■■
	B	- 18	13	■■■■■■■■■
10	A		14	■■■■■■■■■■■
	B		14	■■■■■■■■■■■
11	A		16	■■■■■■■■■■■■■■■
	B		17	■■■■■■■■■■■■■■■■■
12	A		17	■■■■■■■■■■■■■■■■■
	B		18	■■■■■■■■■■■■■■■■■■■
13	A		15	■■■■■■■■■■■■■
	B		14	■■■■■■■■■■■
14	A		14	■■■■■■■■■■■
	B		14	■■■■■■■■■■■
15	A		12	■■■■■■■
	B		12	■■■■■■■
16	A		16	■■■■■■■■■■■■■■■
	B		15	■■■■■■■■■■■■■

NOTE: 1) Final asterisk denotes category of pedestrian activity for which the predicted winds are suitable.
2) % Change greater than 10% based on comparison with Test Condition A.
3) Wind speeds are for a 1% probability.

TEST CONDITION

A	NO-BUILD CONDITION
B	BUILD CONDITION

APPENDIX E2 TABLE 7

ANTICIPATED LEVELS OF PEDESTRIAN WIND COMFORT

AUTUMN

SUGGESTED MEAN (MPH)
WIND SPEEDS FOR -------->

12	15	19	27	
SITTING	STANDING	WALKING	UNCOMFORTABLE FOR WALKING	DANGEROUS CONDITIONS

LOCATION	TEST CONDITION	PERCENTAGE CHANGE	MEAN SPEED (MPH)	10 : 15 20 : 25 : 29+ :
17	A		17	■■■■■■■■■■■■■■■■■
	B	+ 17	20	■■■■■■■■■■■■■■■■■■■■■■■
18	A		15	■■■■■■■■■■■■■
	B	- 46	8	<
19	A		16	■■■■■■■■■■■■■■■
	B		16	■■■■■■■■■■■■■■■
20	A		15	■■■■■■■■■■■■■
	B		14	■■■■■■■■■■■
21	A		17	■■■■■■■■■■■■■■■■■
	B	- 23	13	■■■■■■■■■
22	A		14	■■■■■■■■■■■
	B		15	■■■■■■■■■■■■■
23	A		13	■■■■■■■■■
	B		12	■■■■■■■
24	A		17	■■■■■■■■■■■■■■■■■
	B	- 17	14	■■■■■■■■■■■
25	A		13	■■■■■■■■■
	B	+ 30	17	■■■■■■■■■■■■■■■■■
26	A		16	■■■■■■■■■■■■■■■
	B	- 25	12	■■■■■■■
27	A		16	■■■■■■■■■■■■■■■
	B		17	■■■■■■■■■■■■■■■■■
28	A		15	■■■■■■■■■■■■■
	B		14	■■■■■■■■■■■
29	A		13	■■■■■■■■■
	B	+ 15	15	■■■■■■■■■■■■■
30	A		10	■■■
	B	+ 70	17	■■■■■■■■■■■■■■■■■
31	A		12	■■■■■■■
	B	- 16	10	■■■
32	A		13	■■■■■■■■■
	B		12	■■■■■■■

NOTE: 1) Final asterisk denotes category of pedestrian activity for which the predicted winds are suitable.
2) % Change greater than 10% based on comparison with Test Condition A.
3) Wind speeds are for a 1% probability.

TEST CONDITION

A	NO-BUILD CONDITION
B	BUILD CONDITION

APPENDIX E2 TABLE 8

ANTICIPATED LEVELS OF PEDESTRIAN WIND COMFORT

AUTUMN

SUGGESTED MEAN WIND SPEEDS FOR --------> (MPH)

	12	15	19	27	
SITTING	STANDING	WALKING	UNCOMFORTABLE FOR WALKING	DANGEROUS CONDITIONS	

LOCATION	TEST CONDITION	PERCENTAGE CHANGE	MEAN SPEED (MPH)	10 : 15 : 20 : 25 : 29+ :
33	A		**	NOT TESTED
	B		19	■■■■■■■■■■■■■■■■■■■■■
34	A		**	NOT TESTED
	B		18	■■■■■■■■■■■■■■■■■■■

NOTE: 1) Final asterisk denotes category of pedestrian activity for which the predicted winds are suitable.
2) % Change greater than 10% based on comparison with Test Condition A.
3) Wind speeds are for a 1% probability.

TEST CONDITION

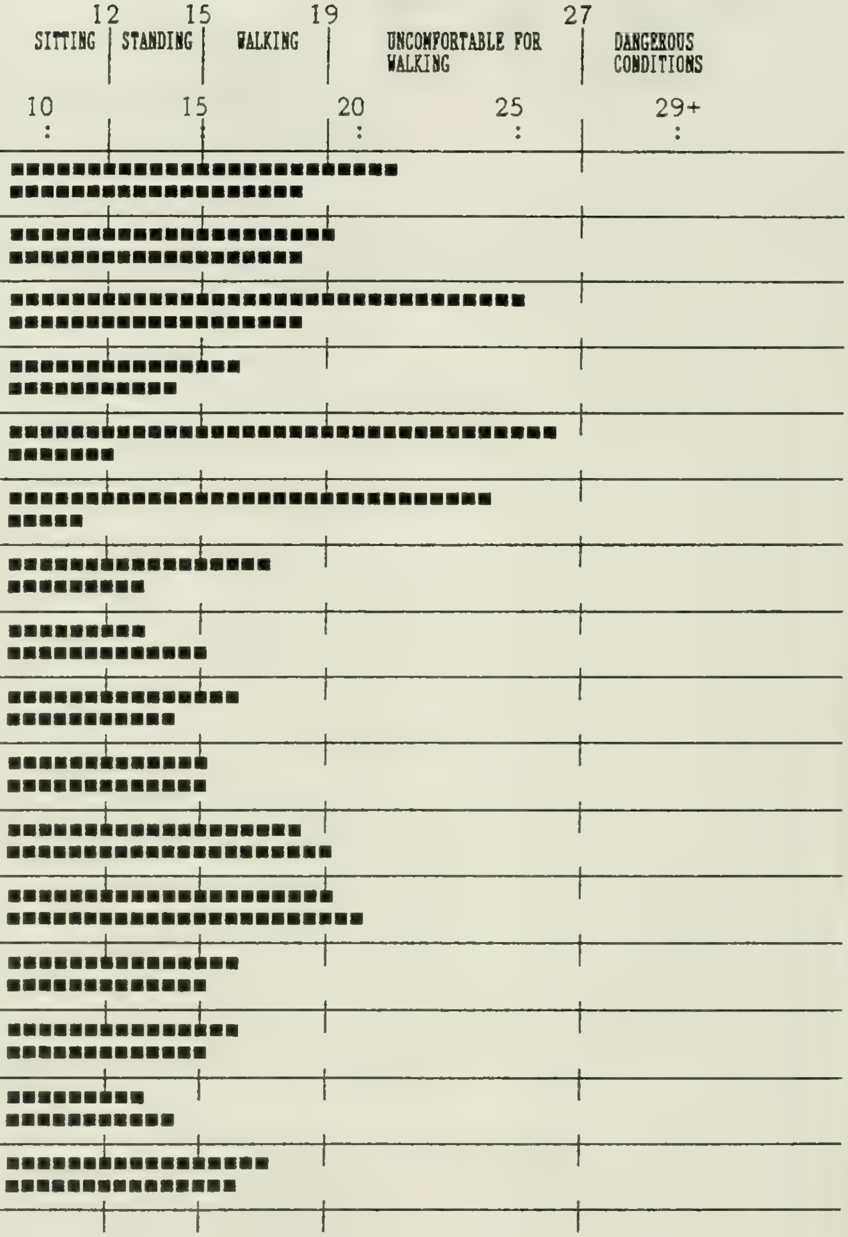
A	NO-BUILD CONDITION
B	BUILD CONDITION

APPENDIX E2 TABLE 9

ANTICIPATED LEVELS OF PEDESTRIAN WIND COMFORT

AUTUMN

SUGGESTED MEAN WIND SPEEDS FOR --------> (MPH)



LOCATION	TEST CONDITION	PERCENTAGE CHANGE	MEAN SPEED (MPH)
1	A		21
	B	- 14	18
2	A		19
	B		18
3	A		25
	B	- 28	18
4	A		16
	B	- 12	14
5	A		26
	B	- 53	12
6	A		24
	B	- 54	11
7	A		17
	B	- 23	13
8	A		13
	B	+ 15	15
9	A		16
	B	- 12	14
10	A		15
	B		15
11	A		18
	B		19
12	A		19
	B		20
13	A		16
	B		15
14	A		16
	B		15
15	A		13
	B		14
16	A		17
	B		16

NOTE:
1) Final asterisk denotes category of pedestrian activity for which the predicted winds are suitable.
2) % Change greater than 10% based on comparison with Test Condition A.
3) Wind speeds are for a 1% probability.

TEST CONDITION

A	NO-BUILD CONDITION
B	BUILD CONDITION

APPENDIX E2 TABLE 10

ANTICIPATED LEVELS OF PEDESTRIAN WIND COMFORT

WINTER

SUGGESTED MEAN (MPH)
WIND SPEEDS FOR -------->

				12	15	19	27	
				SITTING	STANDING	WALKING	UNCOMFORTABLE FOR WALKING	DANGEROUS CONDITIONS

LOCATION	TEST CONDITION	PERCENTAGE CHANGE	MEAN SPEED (MPH)	10 : 15 20 : 25 : 29+ :
17	A		18	*******************
	B	+ 16	21	*************************
18	A		16	***************
	B	- 43	9	*
19	A		16	***************
	B		17	*****************
20	A		15	*************
	B		14	***********
21	A		20	***********************
	B	- 30	14	***********
22	A		15	*************
	B		15	*************
23	A		15	*************
	B		14	***********
24	A		18	*******************
	B	- 22	14	***********
25	A		15	*************
	B	+ 13	17	*****************
26	A		17	*****************
	B	- 23	13	*********
27	A		18	*******************
	B		19	*********************
28	A		16	***************
	B		16	***************
29	A		13	*********
	B	+ 30	17	*****************
30	A		11	*****
	B	+ 63	18	*******************
31	A		14	***********
	B	- 21	11	*****
32	A		14	***********
	B		13	*********

NOTE: 1) Final asterisk denotes category of pedestrian activity for which the predicted winds are suitable.
2) % Change greater than 10% based on comparison with Test Condition A.
3) Wind speeds are for a 1% probability.

TEST CONDITION

A	NO-BUILD CONDITION
B	BUILD CONDITION

APPENDIX E2 TABLE 11

ANTICIPATED LEVELS OF PEDESTRIAN WIND COMFORT

WINTER

SUGGESTED MEAN WIND SPEEDS FOR -------->	(MPH)			12 SITTING | 15 STANDING | 19 WALKING | 27 UNCOMFORTABLE FOR WALKING | DANGEROUS CONDITIONS
LOCATION	TEST CONDITION	PERCENTAGE CHANGE	MEAN SPEED (MPH)	10 : 15 20 : 25 : 29+ :
33	A		**	NOT TESTED
	B		21	■■■■■■■■■■■■■■■■■■■■■■■■■
34	A		**	NOT TESTED
	B		19	■■■■■■■■■■■■■■■■■■■■■

NOTE: 1) Final asterisk denotes category of pedestrian activity for which the predicted winds are suitable.
2) % Change greater than 10% based on comparison with Test Condition A.
3) Wind speeds are for a 1% probability.

TEST CONDITION

A NO-BUILD CONDITION
B BUILD CONDITION

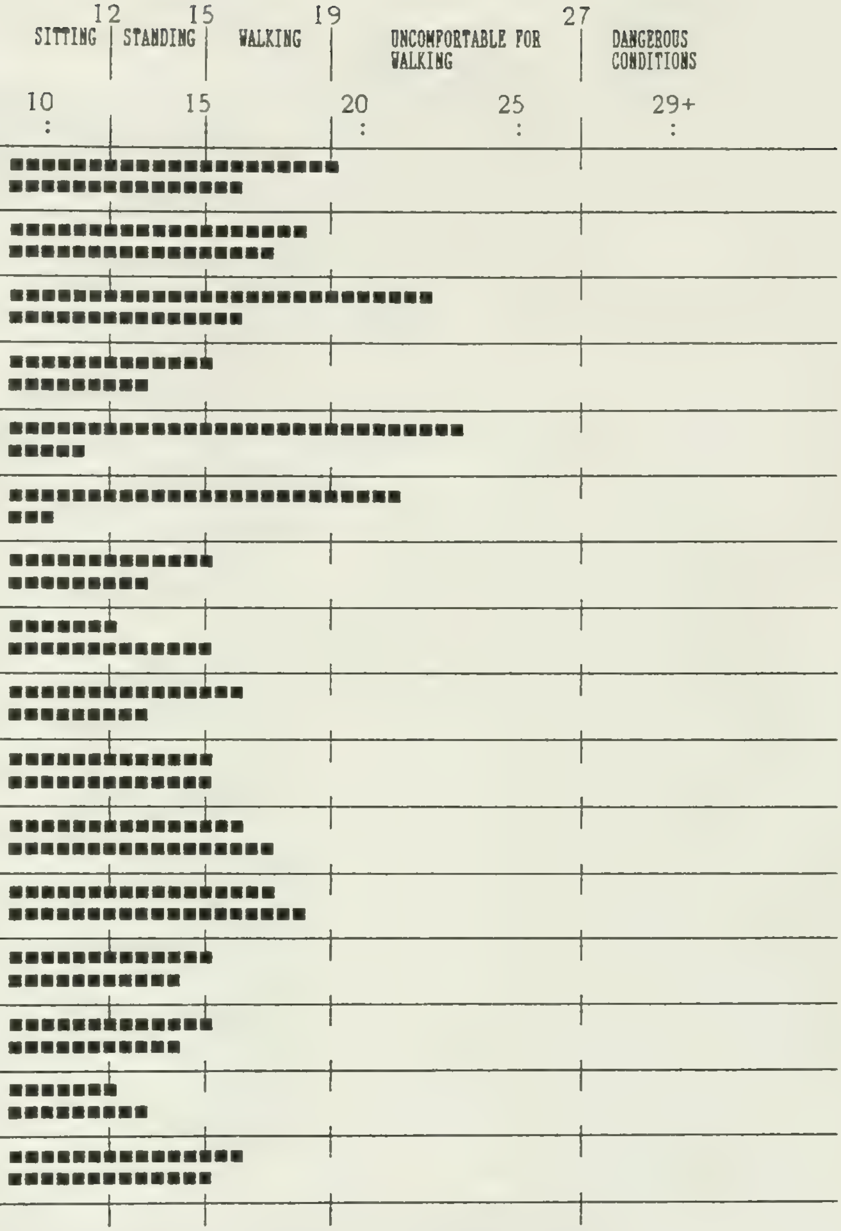
APPENDIX E2 TABLE 12

ANTICIPATED LEVELS OF PEDESTRIAN WIND COMFORT

WINTER

SUGGESTED MEAN (MPH)
WIND SPEEDS FOR -------->

LOCATION	TEST CONDITION	PERCENTAGE CHANGE	MEAN SPEED (MPH)
1	A		19
	B	- 15	16
2	A		18
	B		17
3	A		22
	B	- 27	16
4	A		15
	B	- 13	13
5	A		23
	B	- 52	11
6	A		21
	B	- 52	10
7	A		15
	B	- 13	13
8	A		12
	B	+ 25	15
9	A		16
	B	- 18	13
10	A		15
	B		15
11	A		16
	B		17
12	A		17
	B		18
13	A		15
	B		14
14	A		15
	B		14
15	A		12
	B		13
16	A		16
	B		15



NOTE: 1) Final asterisk denotes category of pedestrian activity for which the predicted winds are suitable.
2) % Change greater than 10% based on comparison with Test Condition A.
3) Wind speeds are for a 1% probability.

TEST CONDITION

A NO-BUILD CONDITION
B BUILD CONDITION

APPENDIX E2 TABLE 13

ANTICIPATED LEVELS OF PEDESTRIAN WIND COMFORT

ANNUAL

SUGGESTED MEAN (MPH) 12 15 19 27
WIND SPEEDS FOR --------> SITTING | STANDING | WALKING | UNCOMFORTABLE FOR WALKING | DANGEROUS CONDITIONS

LOCATION	TEST CONDITION	PERCENTAGE CHANGE	MEAN SPEED (MPH)	10 : 15 20 : 25 : 29+ :
17	A		17	■■■■■■■■■■■■■■■■■
	B	+ 17	20	■■■■■■■■■■■■■■■■■■■■■■■
18	A		15	■■■■■■■■■■■■■
	B	- 40	9	■
19	A		16	■■■■■■■■■■■■■■■
	B		17	■■■■■■■■■■■■■■■■■
20	A		15	■■■■■■■■■■■■■
	B		14	■■■■■■■■■■■
21	A		18	■■■■■■■■■■■■■■■■■■■
	B	- 22	14	■■■■■■■■■■■
22	A		14	■■■■■■■■■■■
	B		15	■■■■■■■■■■■■■
23	A		14	■■■■■■■■■■■
	B		13	■■■■■■■■■
24	A		17	■■■■■■■■■■■■■■■■■
	B	- 17	14	■■■■■■■■■■■
25	A		14	■■■■■■■■■■■
	B	+ 21	17	■■■■■■■■■■■■■■■■■
26	A		17	■■■■■■■■■■■■■■■■■
	B	- 29	12	■■■■■■■
27	A		16	■■■■■■■■■■■■■■■
	B	+ 12	18	■■■■■■■■■■■■■■■■■■■
28	A		15	■■■■■■■■■■■■■
	B		15	■■■■■■■■■■■■■
29	A		13	■■■■■■■■■
	B	+ 23	16	■■■■■■■■■■■■■■■
30	A		11	■■■■■
	B	+ 54	17	■■■■■■■■■■■■■■■■■
31	A		13	■■■■■■■■■
	B	- 23	10	■■■
32	A		13	■■■■■■■■■
	B		12	■■■■■■■

NOTE: 1) Final asterisk denotes category of pedestrian activity for which the predicted winds are suitable.
2) % Change greater than 10% based on comparison with Test Condition A.
3) Wind speeds are for a 1% probability.

TEST CONDITION

A	NO-BUILD CONDITION
B	BUILD CONDITION

APPENDIX E2 TABLE 14

ANTICIPATED LEVELS OF PEDESTRIAN WIND COMFORT

ANNUAL

SUGGESTED MEAN WIND SPEEDS FOR -------->	(MPH)			12 SITTING | 15 STANDING | 19 WALKING | 27 UNCOMFORTABLE FOR WALKING | DANGEROUS CONDITIONS
LOCATION	TEST CONDITION	PERCENTAGE CHANGE	MEAN SPEED (MPH)	10 : 15 20 : 25 : 29+ :
33	A		**	NOT TESTED
	B		19	■■■■■■■■■■■■■■■■■■■■■
34	A		**	NOT TESTED
	B		18	■■■■■■■■■■■■■■■■■■■

NOTE: 1) Final asterisk denotes category of pedestrian activity for which the predicted winds are suitable.
2) % Change greater than 10% based on comparison with Test Condition A.
3) Wind speeds are for a 1% probability.

TEST CONDITION

A	NO-BUILD CONDITION
B	BUILD CONDITION

APPENDIX E2 TABLE 15

ANTICIPATED LEVELS OF PEDESTRIAN WIND COMFORT

ANNUAL

LOCATION	TEST CONDITION	PERCENTAGE CHANGE	GUST SPEED (MPH)	SUGGESTED EFFECTIVE GUST SPEEDS FOR ---> (MPH) <------ ACCEPTABLE ------> 10 : 20 : 30 : 31 | <------ UNACCEPTABLE ------> 40 : 50+ :
1	A		27	■■■■■■■■■■■■■■■■■■
	B	- 14	23	■■■■■■■■■■■■■■
2	A		26	■■■■■■■■■■■■■■■■■
	B		24	■■■■■■■■■■■■■■■
3	A		31	■■■■■■■■■■■■■■■■■■■■■■
	B	- 22	24	■■■■■■■■■■■■■■■
4	A		22	■■■■■■■■■■■■■
	B		20	■■■■■■■■■■■
5	A		33	■■■■■■■■■■■■■■■■■■■■■■■■
	B	- 48	17	■■■■■■■■
6	A		31	■■■■■■■■■■■■■■■■■■■■■■
	B	- 54	14	■■■■■
7	A		24	■■■■■■■■■■■■■■■
	B	- 16	20	■■■■■■■■■■■
8	A		18	■■■■■■■■■
	B	+ 22	22	■■■■■■■■■■■■■
9	A		23	■■■■■■■■■■■■■■
	B	- 13	20	■■■■■■■■■■■
10	A		22	■■■■■■■■■■■■■
	B		22	■■■■■■■■■■■■■
11	A		25	■■■■■■■■■■■■■■■■
	B		26	■■■■■■■■■■■■■■■■■
12	A		25	■■■■■■■■■■■■■■■■
	B		26	■■■■■■■■■■■■■■■■■
13	A		22	■■■■■■■■■■■■■
	B		21	■■■■■■■■■■■■
14	A		22	■■■■■■■■■■■■■
	B		21	■■■■■■■■■■■■
15	A		20	■■■■■■■■■■■
	B		20	■■■■■■■■■■■
16	A		24	■■■■■■■■■■■■■■■
	B		22	■■■■■■■■■■■■■

NOTE: 1) Final asterisk denotes category of pedestrian activity for which the predicted winds are suitable.
2) % Change greater than 10% based on comparison with Test Condition A.
3) Wind speeds are for a 1% probability.

TEST CONDITION

A	NO-BUILD CONDITION
B	BUILD CONDITION

APPENDIX E2 TABLE 16

ANTICIPATED LEVELS OF PEDESTRIAN WIND COMFORT

SPRING

SUGGESTED EFFECTIVE (MPH)
GUST SPEEDS FOR -------> <------ ACCEPTABLE ------> 31 | <------ UNACCEPTABLE ------>

LOCATION	TEST CONDITION	PERCENTAGE CHANGE	GUST SPEED (MPH)	10 : 20 : 30 : | 40 : 50+ :
17	A		27	■■■■■■■■■■■■■■■■■■
	B		28	■■■■■■■■■■■■■■■■■■■
18	A		23	■■■■■■■■■■■■■■
	B	- 47	12	■■■
19	A		26	■■■■■■■■■■■■■■■■■
	B		24	■■■■■■■■■■■■■■■
20	A		24	■■■■■■■■■■■■■■■
	B	- 12	21	■■■■■■■■■■■■
21	A		26	■■■■■■■■■■■■■■■■■
	B	- 19	21	■■■■■■■■■■■■
22	A		21	■■■■■■■■■■■■
	B		22	■■■■■■■■■■■■■
23	A		21	■■■■■■■■■■■■
	B		19	■■■■■■■■■■
24	A		25	■■■■■■■■■■■■■■■■
	B	- 16	21	■■■■■■■■■■■■
25	A		22	■■■■■■■■■■■■■
	B	+ 18	26	■■■■■■■■■■■■■■■■■
26	A		25	■■■■■■■■■■■■■■■■
	B	- 28	18	■■■■■■■■■
27	A		24	■■■■■■■■■■■■■■■
	B		25	■■■■■■■■■■■■■■■■
28	A		23	■■■■■■■■■■■■■■
	B		23	■■■■■■■■■■■■■■
29	A		20	■■■■■■■■■■■
	B	+ 20	24	■■■■■■■■■■■■■■■
30	A		17	■■■■■■■■
	B	+ 52	26	■■■■■■■■■■■■■■■■■
31	A		19	■■■■■■■■■■
	B	- 15	16	■■■■■■■
32	A		21	■■■■■■■■■■■■
	B	- 14	18	■■■■■■■■■

NOTE: 1) Final asterisk denotes category of pedestrian activity for which the predicted winds are suitable.
2) % Change greater than 10% based on comparison with Test Condition A.
3) Wind speeds are for a 1% probability.

TEST CONDITION

A	NO-BUILD CONDITION
B	BUILD CONDITION

APPENDIX E2 TABLE 17

ANTICIPATED LEVELS OF PEDESTRIAN WIND COMFORT

SPRING

SUGGESTED EFFECTIVE (MPH) 31
GUST SPEEDS FOR --------> <------ ACCEPTABLE ------> | <------ UNACCEPTABLE ------>

LOCATION	TEST CONDITION	PERCENTAGE CHANGE	GUST SPEED (MPH)	10 :	20 :	30 :	40 :	50+ :
33	A		**	NOT TESTED				
	B		27	■■■■■■■■■■■■■■■■■■				
34	A		**	NOT TESTED				
	B		28	■■■■■■■■■■■■■■■■■■■				

NOTE: 1) Final asterisk denotes category of pedestrian activity for which the predicted winds are suitable.
2) % Change greater than 10% based on comparison with Test Condition A.
3) Wind speeds are for a 1% probability.

TEST CONDITION

A	NO-BUILD CONDITION
B	BUILD CONDITION

APPENDIX E2 TABLE 18

ANTICIPATED LEVELS OF PEDESTRIAN WIND COMFORT

SPRING

SUGGESTED EFFECTIVE (MPH)
GUST SPEEDS FOR --------> <------ ACCEPTABLE ------> 31 <------ UNACCEPTABLE ------>

LOCATION	TEST CONDITION	PERCENTAGE CHANGE	GUST SPEED (MPH)	10 : 20 : 30 :	40 : 50+ :
1	A		21	■■■■■■■■■■■■	
	B	- 19	17	■■■■■■■■	
2	A		21	■■■■■■■■■■■■	
	B		20	■■■■■■■■■■■	
3	A		23	■■■■■■■■■■■■■■	
	B	- 17	19	■■■■■■■■■■	
4	A		18	■■■■■■■■■	
	B		17	■■■■■■■■	
5	A		24	■■■■■■■■■■■■■■■	
	B	- 41	14	■■■■■	
6	A		22	■■■■■■■■■■■■■	
	B	- 50	11	■■	
7	A		19	■■■■■■■■■■	
	B		18	■■■■■■■■■	
8	A		15	■■■■■■	
	B	+ 20	18	■■■■■■■■■	
9	A		20	■■■■■■■■■■■	
	B	- 10	18	■■■■■■■■■	
10	A		18	■■■■■■■■■	
	B		19	■■■■■■■■■■	
11	A		19	■■■■■■■■■■	
	B		20	■■■■■■■■■■■	
12	A		19	■■■■■■■■■■	
	B		20	■■■■■■■■■■■	
13	A		19	■■■■■■■■■■	
	B		19	■■■■■■■■■■	
14	A		18	■■■■■■■■■	
	B		17	■■■■■■■■	
15	A		15	■■■■■■	
	B		16	■■■■■■■	
16	A		19	■■■■■■■■■■	
	B		18	■■■■■■■■■	

NOTE: 1) Final asterisk denotes category of pedestrian activity for which the predicted winds are suitable.
2) % Change greater than 10% based on comparison with Test Condition A.
3) Wind speeds are for a 1% probability.

TEST CONDITION

A	NO-BUILD CONDITION
B	BUILD CONDITION

APPENDIX E2 TABLE 19

ANTICIPATED LEVELS OF PEDESTRIAN WIND COMFORT

SUMMER

SUGGESTED EFFECTIVE (MPH) GUST SPEEDS FOR ------->				<------ ACCEPTABLE ------> 31	<------ UNACCEPTABLE ------>
LOCATION	TEST CONDITION	PERCENTAGE CHANGE	GUST SPEED (MPH)	10 : 20 : 30 :	40 : 50+ :
17	A		20	■■■■■■■■■■■	
	B	+ 15	23	■■■■■■■■■■■■■■	
18	A		18	■■■■■■■■■	
	B	- 44	10	■	
19	A		19	■■■■■■■■■■	
	B	+ 10	21	■■■■■■■■■■■■	
20	A		18	■■■■■■■■■	
	B		18	■■■■■■■■■	
21	A		21	■■■■■■■■■■■■	
	B	- 19	17	■■■■■■■■	
22	A		17	■■■■■■■■	
	B	+ 17	20	■■■■■■■■■■■	
23	A		17	■■■■■■■■	
	B	- 11	15	■■■■■■	
24	A		22	■■■■■■■■■■■■■	
	B	- 13	19	■■■■■■■■■■	
25	A		17	■■■■■■■■	
	B		18	■■■■■■■■■	
26	A		21	■■■■■■■■■■■■	
	B	- 28	15	■■■■■■	
27	A		20	■■■■■■■■■■■	
	B		20	■■■■■■■■■■■	
28	A		19	■■■■■■■■■■	
	B		18	■■■■■■■■■	
29	A		16	■■■■■■■	
	B	+ 12	18	■■■■■■■■■	
30	A		14	■■■■■	
	B	+ 42	20	■■■■■■■■■■■	
31	A		16	■■■■■■■	
	B	- 25	12	■■■	
32	A		16	■■■■■■■	
	B		15	■■■■■■	

NOTE: 1) Final asterisk denotes category of pedestrian activity for which the predicted winds are suitable.
2) % Change greater than 10% based on comparison with Test Condition A.
3) Wind speeds are for a 1% probability.

TEST CONDITION

A	NO-BUILD CONDITION
B	BUILD CONDITION

APPENDIX E2 TABLE 20

ANTICIPATED LEVELS OF PEDESTRIAN WIND COMFORT

SUMMER

SUGGESTED EFFECTIVE (MPH) GUST SPEEDS FOR -------->				<------ ACCEPTABLE ------>		31	<------ UNACCEPTABLE ------>	
LOCATION	TEST CONDITION	PERCENTAGE CHANGE	GUST SPEED (MPH)	10 :	20 :	30 :	40 :	50+ :
33	A		**	NOT TESTED				
	B		22	■■■■■■■■■■■■■				
34	A		**	NOT TESTED				
	B		22	■■■■■■■■■■■■■				

NOTE: 1) Final asterisk denotes category of pedestrian activity for which the predicted winds are suitable.
2) % Change greater than 10% based on comparison with Test Condition A.
3) Wind speeds are for a 1% probability.

TEST CONDITION

A	NO-BUILD CONDITION
B	BUILD CONDITION

APPENDIX E2 TABLE 21

ANTICIPATED LEVELS OF PEDESTRIAN WIND COMFORT

SUMMER

SUGGESTED EFFECTIVE (MPH) 31
GUST SPEEDS FOR --------> <------ ACCEPTABLE ------> | <------ UNACCEPTABLE ------>

LOCATION	TEST CONDITION	PERCENTAGE CHANGE	GUST SPEED (MPH)	10 : 20 : 30 :	40 : 50+ :
1	A		26	■■■■■■■■■■■■■■■■■	
	B	- 15	22	■■■■■■■■■■■■■	
2	A		25	■■■■■■■■■■■■■■■■	
	B		23	■■■■■■■■■■■■■■	
3	A		29	■■■■■■■■■■■■■■■■■■■■	
	B	- 20	23	■■■■■■■■■■■■■■	
4	A		22	■■■■■■■■■■■■■	
	B		20	■■■■■■■■■■■	
5	A		30	■■■■■■■■■■■■■■■■■■■■■	
	B	- 46	16	■■■■■■■	
6	A		28	■■■■■■■■■■■■■■■■■■■	
	B	- 50	14	■■■■■	
7	A		22	■■■■■■■■■■■■■	
	B	- 13	19	■■■■■■■■■■	
8	A		18	■■■■■■■■■	
	B	+ 16	21	■■■■■■■■■■■■	
9	A		23	■■■■■■■■■■■■■■	
	B	- 13	20	■■■■■■■■■■■	
10	A		21	■■■■■■■■■■■■	
	B		21	■■■■■■■■■■■■	
11	A		24	■■■■■■■■■■■■■■■	
	B		24	■■■■■■■■■■■■■■■	
12	A		24	■■■■■■■■■■■■■■■	
	B		25	■■■■■■■■■■■■■■■■	
13	A		22	■■■■■■■■■■■■■	
	B		21	■■■■■■■■■■■■	
14	A		21	■■■■■■■■■■■■	
	B		20	■■■■■■■■■■■	
15	A		19	■■■■■■■■■■	
	B		20	■■■■■■■■■■■	
16	A		23	■■■■■■■■■■■■■■	
	B		21	■■■■■■■■■■■■	

NOTE: 1) Final asterisk denotes category of pedestrian activity for which the predicted winds are suitable.
2) % Change greater than 10% based on comparison with Test Condition A.
3) Wind speeds are for a 1% probability.

TEST CONDITION

A	NO-BUILD CONDITION
B	BUILD CONDITION

APPENDIX E2 TABLE 22

ANTICIPATED LEVELS OF PEDESTRIAN WIND COMFORT

AUTUMN

SUGGESTED EFFECTIVE (MPH)
GUST SPEEDS FOR -------->

LOCATION	TEST CONDITION	PERCENTAGE CHANGE	GUST SPEED (MPH)	<------ ACCEPTABLE ------> 10 : 20 : 30 :	31 <------ UNACCEPTABLE ------> 40 : 50+ :
17	A		25	■■■■■■■■■■■■■■■■	
	B	+ 12	28	■■■■■■■■■■■■■■■■■■■	
18	A		22	■■■■■■■■■■■■■	
	B	- 45	12	■■■	
19	A		24	■■■■■■■■■■■■■■■	
	B		24	■■■■■■■■■■■■■■■	
20	A		23	■■■■■■■■■■■■■■	
	B		21	■■■■■■■■■■■■	
21	A		25	■■■■■■■■■■■■■■■■	
	B	- 20	20	■■■■■■■■■■■	
22	A		20	■■■■■■■■■■■	
	B	+ 10	22	■■■■■■■■■■■■■	
23	A		20	■■■■■■■■■■■	
	B		19	■■■■■■■■■■	
24	A		25	■■■■■■■■■■■■■■■■	
	B	- 16	21	■■■■■■■■■■■■	
25	A		21	■■■■■■■■■■■■	
	B	+ 14	24	■■■■■■■■■■■■■■■	
26	A		24	■■■■■■■■■■■■■■■	
	B	- 25	18	■■■■■■■■■	
27	A		23	■■■■■■■■■■■■■■	
	B		24	■■■■■■■■■■■■■■■	
28	A		22	■■■■■■■■■■■■■	
	B		22	■■■■■■■■■■■■■	
29	A		20	■■■■■■■■■■■	
	B	+ 10	22	■■■■■■■■■■■■■	
30	A		16	■■■■■■■	
	B	+ 50	24	■■■■■■■■■■■■■■■	
31	A		18	■■■■■■■■■	
	B	- 16	15	■■■■■■	
32	A		20	■■■■■■■■■■■	
	B	- 10	18	■■■■■■■■■	

NOTE: 1) Final asterisk denotes category of pedestrian activity for which the predicted winds are suitable.
2) % Change greater than 10% based on comparison with Test Condition A.
3) Wind speeds are for a 1% probability.

TEST CONDITION

A NO-BUILD CONDITION
B BUILD CONDITION

APPENDIX E2 TABLE 23

ANTICIPATED LEVELS OF PEDESTRIAN WIND COMFORT

AUTUMN

SUGGESTED EFFECTIVE (MPH) GUST SPEEDS FOR -------> <------ ACCEPTABLE ------> 31 <------ UNACCEPTABLE ------>

LOCATION	TEST CONDITION	PERCENTAGE CHANGE	GUST SPEED (MPH)	10 : 20 : 30 :	40 : 50+ :
33	A		**	NOT TESTED	
	B		26	■■■■■■■■■■■■■■■■■	
34	A		**	NOT TESTED	
	B		27	■■■■■■■■■■■■■■■■■■	

NOTE: 1) Final asterisk denotes category of pedestrian activity for which the predicted winds are suitable.
2) % Change greater than 10% based on comparison with Test Condition A.
3) Wind speeds are for a 1% probability.

TEST CONDITION

A NO-BUILD CONDITION
B BUILD CONDITION

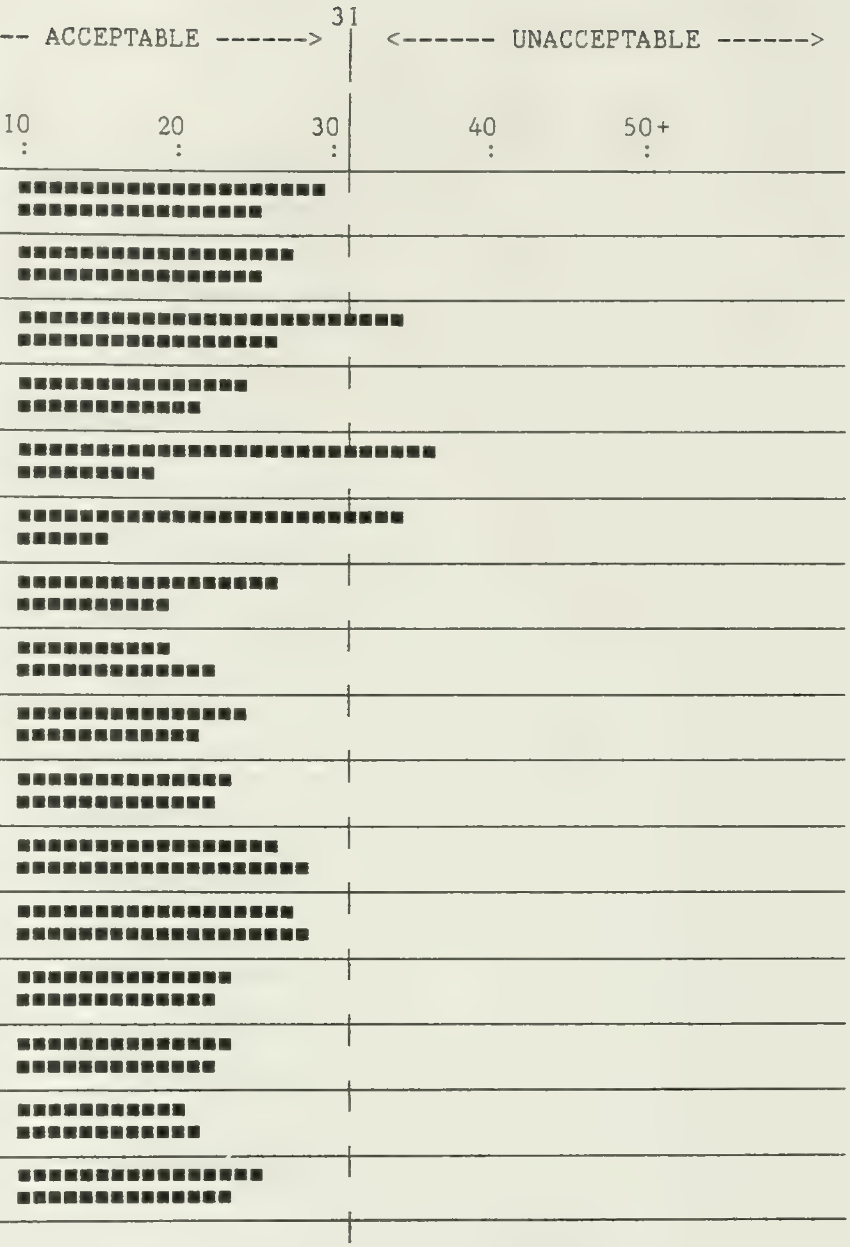
APPENDIX E2 TABLE 24

ANTICIPATED LEVELS OF PEDESTRIAN WIND COMFORT

AUTUMN

SUGGESTED EFFECTIVE (MPH)
GUST SPEEDS FOR -------->

LOCATION	TEST CONDITION	PERCENTAGE CHANGE	GUST SPEED (MPH)
1	A		29
	B	- 13	25
2	A		27
	B		25
3	A		34
	B	- 23	26
4	A		24
	B	- 12	21
5	A		36
	B	- 50	18
6	A		34
	B	- 55	15
7	A		26
	B	- 26	19
8	A		19
	B	+ 15	22
9	A		24
	B	- 12	21
10	A		23
	B		22
11	A		26
	B		28
12	A		27
	B		28
13	A		23
	B		22
14	A		23
	B		22
15	A		20
	B		21
16	A		25
	B		23



NOTE: 1) Final asterisk denotes category of pedestrian activity for which the predicted winds are suitable.
2) % Change greater than 10% based on comparison with Test Condition A.
3) Wind speeds are for a 1% probability.

TEST CONDITION

A NO-BUILD CONDITION
B BUILD CONDITION

APPENDIX E2 TABLE 25

ANTICIPATED LEVELS OF PEDESTRIAN WIND COMFORT

WINTER

LOCATION	TEST CONDITION	PERCENTAGE CHANGE	GUST SPEED (MPH)	SUGGESTED EFFECTIVE (MPH) GUST SPEEDS FOR -------> <------ ACCEPTABLE ------> 31 10 : 20 : 30 :	<------ UNACCEPTABLE ------> 40 : 50+ :
17	A		26	■■■■■■■■■■■■■■■■■	
	B	+ 11	29	■■■■■■■■■■■■■■■■■■■■	
18	A		24	■■■■■■■■■■■■■■■	
	B	- 50	12	■■■	
19	A		24	■■■■■■■■■■■■■■■	
	B		24	■■■■■■■■■■■■■■■	
20	A		23	■■■■■■■■■■■■■■	
	B		21	■■■■■■■■■■■■	
21	A		28	■■■■■■■■■■■■■■■■■■■	
	B	- 21	22	■■■■■■■■■■■■■	
22	A		22	■■■■■■■■■■■■■	
	B		23	■■■■■■■■■■■■■■	
23	A		22	■■■■■■■■■■■■■	
	B		21	■■■■■■■■■■■■	
24	A		26	■■■■■■■■■■■■■■■■■	
	B	- 19	21	■■■■■■■■■■■■	
25	A		24	■■■■■■■■■■■■■■■	
	B		24	■■■■■■■■■■■■■■■	
26	A		25	■■■■■■■■■■■■■■■■	
	B	- 20	20	■■■■■■■■■■■	
27	A		26	■■■■■■■■■■■■■■■■■	
	B		27	■■■■■■■■■■■■■■■■■■	
28	A		23	■■■■■■■■■■■■■■	
	B		25	■■■■■■■■■■■■■■■■	
29	A		20	■■■■■■■■■■■	
	B	+ 25	25	■■■■■■■■■■■■■■■■	
30	A		18	■■■■■■■■■	
	B	+ 44	26	■■■■■■■■■■■■■■■■■	
31	A		21	■■■■■■■■■■■■	
	B	- 19	17	■■■■■■■■	
32	A		22	■■■■■■■■■■■■■	
	B	- 13	19	■■■■■■■■■■	

NOTE: 1) Final asterisk denotes category of pedestrian activity for which the predicted winds are suitable.
2) % Change greater than 10% based on comparison with Test Condition A.
3) Wind speeds are for a 1% probability.

TEST CONDITION

A	NO-BUILD CONDITION
B	BUILD CONDITION

APPENDIX E2 TABLE 26

ANTICIPATED LEVELS OF PEDESTRIAN WIND COMFORT

WINTER

SUGGESTED EFFECTIVE (MPH) GUST SPEEDS FOR -------> <------ ACCEPTABLE ------> 31 | <------ UNACCEPTABLE ------>

LOCATION	TEST CONDITION	PERCENTAGE CHANGE	GUST SPEED (MPH)	10 : 20 : 30 :	40 : 50+ :
33	A		**	NOT TESTED	
	B		28	■■■■■■■■■■■■■■■■■■■	
34	A		**	NOT TESTED	
	B		29	■■■■■■■■■■■■■■■■■■■■	

NOTE: 1) Final asterisk denotes category of pedestrian activity for which the predicted winds are suitable.
2) % Change greater than 10% based on comparison with Test Condition A.
3) Wind speeds are for a 1% probability.

TEST CONDITION

A	NO-BUILD CONDITION
B	BUILD CONDITION

APPENDIX E2 TABLE 27

ANTICIPATED LEVELS OF PEDESTRIAN WIND COMFORT

WINTER

SUGGESTED EFFECTIVE GUST SPEEDS FOR -------->		(MPH)		31 <------ ACCEPTABLE ------>	<------ UNACCEPTABLE ------>
LOCATION	TEST CONDITION	PERCENTAGE CHANGE	GUST SPEED (MPH)	10 : 20 : 30 :	40 : 50+ :
1	A		27	■■■■■■■■■■■■■■■■■■	
	B	- 18	22	■■■■■■■■■■■■■	
2	A		26	■■■■■■■■■■■■■■■■■	
	B		24	■■■■■■■■■■■■■■■	
3	A		31	■■■■■■■■■■■■■■■■■■■■■■	
	B	- 22	24	■■■■■■■■■■■■■■■	
4	A		22	■■■■■■■■■■■■■	
	B		20	■■■■■■■■■■■	
5	A		32	■■■■■■■■■■■■■■■■■■■■■■■	
	B	- 46	17	■■■■■■■■	
6	A		30	■■■■■■■■■■■■■■■■■■■■■	
	B	- 53	14	■■■■■	
7	A		23	■■■■■■■■■■■■■■	
	B	- 17	19	■■■■■■■■■■	
8	A		18	■■■■■■■■■	
	B	+ 16	21	■■■■■■■■■■■■	
9	A		23	■■■■■■■■■■■■■■	
	B	- 13	20	■■■■■■■■■■■	
10	A		22	■■■■■■■■■■■■■	
	B		21	■■■■■■■■■■■■	
11	A		24	■■■■■■■■■■■■■■■	
	B		25	■■■■■■■■■■■■■■■■	
12	A		25	■■■■■■■■■■■■■■■■	
	B		26	■■■■■■■■■■■■■■■■■	
13	A		22	■■■■■■■■■■■■■	
	B		21	■■■■■■■■■■■■	
14	A		22	■■■■■■■■■■■■■	
	B		21	■■■■■■■■■■■■	
15	A		19	■■■■■■■■■■	
	B		20	■■■■■■■■■■■	
16	A		24	■■■■■■■■■■■■■■■	
	B		22	■■■■■■■■■■■■■	

NOTE: 1) Final asterisk denotes category of pedestrian activity for which the predicted winds are suitable.
2) % Change greater than 10% based on comparison with Test Condition A.
3) Wind speeds are for a 1% probability.

TEST CONDITION

A	NO-BUILD CONDITION
B	BUILD CONDITION

APPENDIX E2 TABLE 28

ANTICIPATED LEVELS OF PEDESTRIAN WIND COMFORT

ANNUAL

SUGGESTED EFFECTIVE (MPH)
GUST SPEEDS FOR -------> <------ ACCEPTABLE ------> 31 <------ UNACCEPTABLE ------>

LOCATION	TEST CONDITION	PERCENTAGE CHANGE	GUST SPEED (MPH)	10 : 20 : 30 :	40 : 50+ :
17	A		25	■■■■■■■■■■■■■■■■	
	B	+ 12	28	■■■■■■■■■■■■■■■■■■■	
18	A		22	■■■■■■■■■■■■■	
	B	- 45	12	■■■	
19	A		24	■■■■■■■■■■■■■■■	
	B		24	■■■■■■■■■■■■■■■	
20	A		23	■■■■■■■■■■■■■■	
	B		21	■■■■■■■■■■■■	
21	A		26	■■■■■■■■■■■■■■■■■	
	B	- 19	21	■■■■■■■■■■■■	
22	A		21	■■■■■■■■■■■■	
	B		22	■■■■■■■■■■■■■	
23	A		21	■■■■■■■■■■■■	
	B		19	■■■■■■■■■■	
24	A		25	■■■■■■■■■■■■■■■■	
	B	- 16	21	■■■■■■■■■■■■	
25	A		22	■■■■■■■■■■■■■	
	B		24	■■■■■■■■■■■■■■■	
26	A		24	■■■■■■■■■■■■■■■	
	B	- 25	18	■■■■■■■■■	
27	A		24	■■■■■■■■■■■■■■■	
	B		25	■■■■■■■■■■■■■■■■	
28	A		22	■■■■■■■■■■■■■	
	B		23	■■■■■■■■■■■■■■	
29	A		20	■■■■■■■■■■■	
	B	+ 15	23	■■■■■■■■■■■■■■	
30	A		16	■■■■■■■	
	B	+ 56	25	■■■■■■■■■■■■■■■■	
31	A		19	■■■■■■■■■■	
	B	- 15	16	■■■■■■■	
32	A		21	■■■■■■■■■■■■	
	B	- 14	18	■■■■■■■■■	

NOTE: 1) Final asterisk denotes category of pedestrian activity for which the predicted winds are suitable.
2) % Change greater than 10% based on comparison with Test Condition A.
3) Wind speeds are for a 1% probability.

TEST CONDITION

A	NO-BUILD CONDITION
B	BUILD CONDITION

APPENDIX E2 TABLE 29

ANTICIPATED LEVELS OF PEDESTRIAN WIND COMFORT

ANNUAL

SUGGESTED EFFECTIVE GUST SPEEDS FOR ------->		(MPH)		<------ ACCEPTABLE ------>		31	<------ UNACCEPTABLE ------>	
LOCATION	TEST CONDITION	PERCENTAGE CHANGE	GUST SPEED (MPH)	10 :	20 :	30 :	40 :	50+ :
33	A		**	NOT TESTED				
	B		27	■■■■■■■■■■■■■■■■■■				
34	A		**	NOT TESTED				
	B		27	■■■■■■■■■■■■■■■■■■				

NOTE: 1) Final asterisk denotes category of pedestrian activity for which the predicted winds are suitable.
2) % Change greater than 10% based on comparison with Test Condition A.
3) Wind speeds are for a 1% probability.

TEST CONDITION

A	NO-BUILD CONDITION
B	BUILD CONDITION

APPENDIX E2 TABLE 30

ANTICIPATED LEVELS OF PEDESTRIAN WIND COMFORT

ANNUAL

APPENDIX E3

APPENDIX E3

PEDESTRIAN LEVEL WIND TEST DATA

The wind speed ratios presented in this Appendix are a ratio of the wind speed at a sensor location (5 feet above the ground) to the mean wind speed which occurs at gradient height. To understand this, consider the wind speed ratio presented for Location 1 (No-Build) on Table E3-1 pertaining to the study site. The conditions at Location 1 indicate that a mean wind speed ratio of 0.28 occurs for a northeast wind direction. This ratio indicates that, for a northeast wind direction, the 5 foot level wind speed would be 0.28 times or 28% of the wind speed at gradient height. Hence a 100 mph gradient wind speed would be reduced to 28 mph at Location 1 for a northeast wind direction.

The last two columns of values for each location present a weighting factor for the spring (SPR), and summer (SUM); autumn (FAL) and winter (WIN) and annual (ANNUAL). These factors are a measure of how each wind direction affects the overall comfort level at each location. The weighting factor is derived from an analysis of the wind tunnel test data (gust wind speed ratios) and the wind records obtained from the local weather station. As a result of this analysis, the weighting factor is dependent upon each of the following:

- i) the gust wind speed ratio measured at the sensor
- ii) the frequency of occurrence of the wind direction being examined
- iii) the strength of the wind for the same wind direction examined

The weighting factors are expressed as a percentage. For instance, the spring weighting factor for our example, Location 2 and a west-northwest direction, is 69%. This indicates that 69% of the time when the monthly gust wind speeds are exceeded at Location 1, the wind will occur from this direction. The weighting factors allow one to look at each sensor and immediately determine which wind direction(s) has the greatest impact on the resultant wind comfort level. For example, the most important wind directions for Location 1 during the spring are WNW and NW. Since the weighting factors are based on a meteorological data analysis, they will vary from season to season for a given test location and direction. This is evident in our location as the west-northwest wind direction during the spring has a weighting factor of 69% and during the summer the weighting factor is 58%.

NO-BUILD

LOCATION 1

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	SPR	SUM
NNE	.24	.56	0	0
NE	.28	.55	2	5
ENE	.27	.54	2	1
E	.24	.47	0	0
ESE	.26	.62	0	0
SE	.32	.72	0	0
SSE	.22	.55	0	0
S	.28	.56	0	0
SSW	.30	.59	0	3
SW	.19	.46	0	0
WSW	.25	.50	0	1
W	.24	.48	0	1
WNW	.36	.59	69	58
NW	.34	.63	27	31
NNW	.19	.46	0	0
N	.21	.51	0	0

LOCATION 2

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	SPR	SUM
NNE	.32	.64	2	4
NE	.35	.63	20	16
ENE	.33	.56	15	5
E	.26	.51	1	0
ESE	.22	.47	0	0
SE	.23	.55	0	0
SSE	.22	.50	0	0
S	.24	.53	0	0
SSW	.34	.64	2	12
SW	.31	.68	2	22
WSW	.24	.49	0	1
W	.28	.61	6	4
WNW	.31	.54	38	25
NW	.30	.57	14	12
NNW	.22	.48	0	0
N	.28	.58	0	0

LOCATION 3

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	SPR	SUM
NNE	.22	.52	0	0
NE	.25	.52	0	1
ENE	.22	.45	0	0
E	.20	.44	0	0
ESE	.29	.55	0	0
SE	.36	.76	0	0
SSE	.29	.64	0	0
S	.30	.61	0	0
SSW	.31	.61	0	1
SW	.27	.55	0	2
WSW	.20	.46	0	0
W	.36	.67	7	11
WNW	.45	.75	93	82
NW	.30	.64	0	2
NNW	.21	.53	0	0
N	.27	.56	0	0

BUILD

LOCATION 1

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	SPR	SUM
NNE	.27	.60	2	6
NE	.28	.64	10	13
ENE	.26	.54	8	4
E	.17	.35	0	0
ESE	.22	.44	0	0
SE	.22	.45	0	0
SSE	.22	.44	0	0
S	.23	.47	0	0
SSW	.19	.44	0	0
SW	.17	.37	0	0
WSW	.23	.57	0	4
W	.20	.38	0	0
WNW	.31	.52	81	69
NW	.19	.41	0	1
NNW	.18	.40	0	0
N	.23	.50	0	1

LOCATION 2

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	SPR	SUM
NNE	.20	.43	0	0
NE	.17	.39	0	0
ENE	.31	.60	16	4
E	.22	.43	0	0
ESE	.25	.52	0	0
SE	.28	.54	0	0
SSE	.24	.50	0	0
S	.28	.62	1	0
SSW	.32	.62	1	9
SW	.32	.58	8	37
WSW	.29	.57	3	9
W	.27	.52	7	3
WNW	.31	.53	59	31
NW	.25	.54	3	3
NNW	.26	.59	1	2
N	.25	.49	0	0

LOCATION 3

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	SPR	SUM
NNE	.33	.75	11	14
NE	.24	.61	3	5
ENE	.21	.48	1	0
E	.16	.34	0	0
ESE	.15	.30	0	0
SE	.18	.41	0	0
SSE	.24	.57	0	0
S	.27	.63	1	1
SSW	.24	.56	0	2
SW	.20	.45	0	2
WSW	.18	.38	0	0
W	.18	.37	0	0
WNW	.30	.56	69	50
NW	.25	.46	7	10
NNW	.26	.58	2	6
N	.33	.71	7	10

TABLE E3-1

PEDESTRIAN LEVEL WIND TEST DATA

NO-BUILD

LOCATION 4

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	SPR	SUM
NNE	.29	.62	7	8
NE	.26	.54	12	11
ENE	.23	.53	6	1
E	.22	.52	1	1
ESE	.29	.54	2	1
SE	.35	.65	2	3
SSE	.29	.60	0	2
S	.27	.55	2	2
SSW	.31	.59	7	24
SW	.18	.41	0	1
WSW	.22	.50	1	4
W	.21	.43	2	1
WNW	.20	.46	6	4
NW	.28	.58	48	31
NNW	.23	.51	1	2
N	.26	.61	2	2

LOCATION 5

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	SPR	SUM
NNE	.19	.47	0	0
NE	.23	.51	0	0
ENE	.23	.51	0	0
E	.19	.42	0	0
ESE	.21	.46	0	0
SE	.27	.57	0	0
SSE	.24	.57	0	0
S	.23	.55	0	0
SSW	.24	.52	0	0
SW	.21	.48	0	0
WSW	.18	.41	0	0
W	.31	.62	1	2
WNW	.47	.80	99	94
NW	.32	.68	1	4
NNW	.22	.52	0	0
N	.27	.54	0	0

LOCATION 6

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	SPR	SUM
NNE	.17	.42	0	0
NE	.20	.47	0	0
ENE	.19	.46	0	0
E	.18	.39	0	0
ESE	.19	.44	0	0
SE	.24	.55	0	0
SSE	.21	.49	0	0
S	.20	.48	0	0
SSW	.22	.53	0	0
SW	.18	.44	0	0
WSW	.16	.36	0	0
W	.23	.52	0	0
WNW	.42	.76	101	98
NW	.27	.62	0	2
NNW	.20	.53	0	0
N	.25	.56	0	0

BUILD

LOCATION 4

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	SPR	SUM
NNE	.30	.69	20	14
NE	.26	.64	25	14
ENE	.22	.48	9	2
E	.16	.30	0	0
ESE	.16	.30	0	0
SE	.19	.42	0	0
SSE	.22	.52	0	0
S	.24	.52	2	1
SSW	.24	.47	1	5
SW	.27	.51	12	40
WSW	.23	.51	3	8
W	.21	.42	6	2
WNW	.19	.42	8	4
NW	.20	.47	5	3
NNW	.20	.44	1	1
N	.27	.60	6	5

LOCATION 5

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	SPR	SUM
NNE	.16	.32	0	0
NE	.14	.27	0	1
ENE	.16	.34	2	0
E	.14	.27	0	0
ESE	.15	.28	0	0
SE	.17	.39	0	0
SSE	.20	.44	0	1
S	.21	.48	2	1
SSW	.21	.44	1	6
SW	.21	.46	6	32
WSW	.18	.43	1	5
W	.19	.44	12	7
WNW	.20	.41	49	27
NW	.20	.39	21	14
NNW	.19	.38	4	5
N	.18	.36	0	1

LOCATION 6

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	SPR	SUM
NNE	.15	.33	1	1
NE	.15	.27	3	5
ENE	.17	.38	9	2
E	.15	.26	1	1
ESE	.15	.25	0	0
SE	.15	.26	0	0
SSE	.15	.28	0	0
S	.15	.31	0	0
SSW	.15	.29	0	1
SW	.17	.33	1	17
WSW	.17	.38	4	13
W	.18	.39	17	12
WNW	.18	.40	51	32
NW	.17	.36	13	11
NNW	.16	.31	1	3
N	.15	.26	0	0

TABLE E3-2

PEDESTRIAN LEVEL WIND TEST DATA

	NO-BUILD				BUILD			
	LOCATION 7				LOCATION 7			
WIND	RATIOS		WEIGHT		RATIOS		WEIGHT	
ANGLE	MEAN	GUST	SPR	SUM	MEAN	GUST	SPR	SUM
NNE	.19	.45	0	0	.14	.34	0	0
NE	.23	.53	3	4	.16	.36	0	0
ENE	.22	.50	3	0	.16	.35	0	0
E	.19	.41	0	0	.15	.32	0	0
ESE	.19	.41	0	0	.17	.38	0	0
SE	.25	.58	0	0	.29	.56	0	0
SSE	.19	.44	0	0	.29	.61	1	1
S	.25	.55	1	0	.38	.69	32	27
SSW	.30	.66	3	11	.39	.68	66	71
SW	.30	.61	10	40	.19	.48	0	1
WSW	.25	.56	3	7	.15	.35	0	0
W	.20	.45	1	0	.16	.38	0	0
WNW	.29	.59	77	37	.17	.39	1	0
NW	.18	.46	0	0	.15	.31	0	0
NNW	.17	.41	0	0	.18	.36	0	0
N	.22	.52	0	0	.13	.27	0	0

	LOCATION 8				LOCATION 8			
WIND	RATIOS		WEIGHT		RATIOS		WEIGHT	
ANGLE	MEAN	GUST	SPR	SUM	MEAN	GUST	SPR	SUM
NNE	.18	.44	1	1	.31	.63	8	8
NE	.23	.51	19	14	.38	.69	64	33
ENE	.21	.49	11	3	.22	.53	2	0
E	.19	.47	1	1	.17	.30	0	0
ESE	.21	.50	1	0	.21	.40	0	0
SE	.23	.60	0	0	.32	.56	0	0
SSE	.21	.48	0	1	.27	.53	0	1
S	.22	.48	2	2	.33	.55	6	6
SSW	.26	.55	9	30	.34	.57	10	27
SW	.19	.42	0	10	.27	.49	2	17
WSW	.16	.30	0	1	.19	.38	0	0
W	.17	.36	2	1	.19	.39	0	0
WNW	.21	.50	47	28	.19	.37	2	1
NW	.19	.40	6	6	.19	.34	0	0
NNW	.17	.35	0	1	.25	.45	2	2
N	.19	.44	0	0	.29	.50	3	3

	LOCATION 9				LOCATION 9			
WIND	RATIOS		WEIGHT		RATIOS		WEIGHT	
ANGLE	MEAN	GUST	SPR	SUM	MEAN	GUST	SPR	SUM
NNE	.25	.54	1	1	.22	.49	2	1
NE	.31	.62	23	13	.20	.42	3	3
ENE	.26	.56	9	1	.26	.49	23	4
E	.27	.53	4	1	.24	.47	5	2
ESE	.28	.55	1	0	.25	.48	1	0
SE	.34	.70	1	0	.30	.60	1	1
SSE	.19	.47	0	0	.22	.51	0	0
S	.26	.63	1	0	.31	.68	12	8
SSW	.31	.68	4	11	.32	.70	24	35
SW	.31	.63	10	34	.27	.64	16	39
WSW	.31	.59	11	20	.21	.50	1	2
W	.29	.53	24	10	.19	.44	2	0
WNW	.22	.46	7	3	.18	.38	5	2
NW	.24	.46	5	3	.19	.38	2	1
NNW	.16	.34	0	0	.18	.36	0	0
N	.19	.46	0	0	.16	.36	0	0

TABLE E3-3

PEDESTRIAN LEVEL WIND TEST DATA

NO-BUILD

LOCATION 10

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	SPR	SUM
NNE	.19	.45	0	0
NE	.25	.54	8	7
ENE	.26	.54	14	3
E	.23	.47	1	1
ESE	.22	.47	0	0
SE	.29	.64	0	0
SSE	.17	.42	0	0
S	.20	.48	0	0
SSW	.27	.62	1	6
SW	.28	.59	7	29
WSW	.30	.58	17	29
W	.28	.53	32	16
WNW	.22	.46	16	7
NW	.21	.45	3	2
NNW	.16	.36	0	0
N	.21	.52	0	0

LOCATION 11

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	SPR	SUM
NNE	.20	.46	0	0
NE	.32	.67	18	19
ENE	.31	.62	17	9
E	.23	.47	0	1
ESE	.23	.44	0	0
SE	.20	.45	0	0
SSE	.16	.37	0	0
S	.16	.36	0	0
SSW	.16	.33	0	0
SW	.18	.39	0	0
WSW	.18	.44	0	0
W	.20	.48	0	0
WNW	.25	.52	13	14
NW	.32	.65	51	49
NNW	.28	.61	2	8
N	.18	.45	0	0

LOCATION 12

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	SPR	SUM
NNE	.19	.47	0	0
NE	.29	.63	8	11
ENE	.33	.65	22	12
E	.28	.50	2	2
ESE	.28	.48	0	0
SE	.24	.45	0	0
SSE	.24	.46	0	0
S	.17	.35	0	0
SSW	.18	.42	0	0
SW	.21	.46	0	2
WSW	.20	.48	0	0
W	.22	.54	0	1
WNW	.27	.56	18	18
NW	.33	.64	47	44
NNW	.30	.64	4	11
N	.18	.41	0	0

BUILD

LOCATION 10

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	SPR	SUM
NNE	.16	.45	0	0
NE	.16	.40	0	0
ENE	.25	.48	9	1
E	.24	.49	2	1
ESE	.26	.53	1	0
SE	.36	.68	2	2
SSE	.27	.60	0	1
S	.36	.76	17	16
SSW	.38	.71	45	66
SW	.20	.54	0	1
WSW	.16	.41	0	0
W	.18	.42	0	0
WNW	.22	.43	11	5
NW	.23	.39	7	4
NNW	.26	.46	5	4
N	.15	.41	0	0

LOCATION 11

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	SPR	SUM
NNE	.22	.48	0	0
NE	.25	.55	2	5
ENE	.24	.56	2	0
E	.18	.43	0	0
ESE	.19	.42	0	0
SE	.26	.52	0	0
SSE	.18	.46	0	0
S	.23	.62	0	0
SSW	.24	.59	0	1
SW	.17	.41	0	0
WSW	.18	.44	0	0
W	.18	.41	0	0
WNW	.23	.50	4	5
NW	.35	.68	63	51
NNW	.37	.71	32	40
N	.22	.50	0	0

LOCATION 12

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	SPR	SUM
NNE	.23	.53	0	0
NE	.32	.60	11	13
ENE	.30	.63	7	3
E	.25	.48	0	0
ESE	.26	.48	0	0
SE	.30	.51	0	0
SSE	.31	.58	0	1
S	.24	.53	0	0
SSW	.22	.52	0	0
SW	.18	.41	0	0
WSW	.21	.51	0	0
W	.20	.48	0	0
WNW	.26	.57	9	9
NW	.35	.66	50	43
NNW	.37	.70	23	32
N	.23	.53	0	0

TABLE E3-4

PEDESTRIAN LEVEL WIND TEST DATA

NO-BUILD

LOCATION 13

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	SPR	SUM
NNE	.25	.51	2	2
NE	.31	.63	31	19
ENE	.22	.48	2	0
E	.21	.47	0	0
ESE	.25	.57	0	0
SE	.24	.60	0	0
SSE	.19	.46	0	0
S	.25	.56	1	0
SSW	.26	.67	0	4
SW	.28	.65	6	30
WSW	.28	.61	7	16
W	.27	.50	24	14
WNW	.24	.47	22	11
NW	.22	.44	4	3
NNW	.14	.30	0	0
N	.16	.40	0	0

LOCATION 14

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	SPR	SUM
NNE	.21	.48	0	1
NE	.25	.55	8	9
ENE	.28	.55	20	7
E	.25	.51	2	2
ESE	.23	.47	0	0
SE	.30	.74	0	0
SSE	.22	.54	0	0
S	.19	.46	0	0
SSW	.21	.49	0	1
SW	.24	.53	1	14
WSW	.27	.56	7	21
W	.27	.53	24	19
WNW	.25	.53	36	24
NW	.21	.44	1	2
NNW	.17	.40	0	0
N	.20	.44	0	0

LOCATION 15

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	SPR	SUM
NNE	.19	.52	1	2
NE	.31	.66	71	44
ENE	.20	.56	7	3
E	.16	.37	0	0
ESE	.15	.37	0	0
SE	.15	.36	0	0
SSE	.14	.31	0	0
S	.14	.30	0	0
SSW	.21	.50	0	6
SW	.20	.47	1	16
WSW	.15	.37	0	1
W	.16	.39	0	0
WNW	.16	.41	3	3
NW	.21	.52	16	18
NNW	.20	.49	1	4
N	.16	.38	0	0

BUILD

LOCATION 13

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	SPR	SUM
NNE	.15	.32	0	0
NE	.20	.42	2	2
ENE	.24	.48	11	1
E	.23	.43	2	1
ESE	.24	.47	1	0
SE	.30	.59	1	0
SSE	.21	.56	0	0
S	.24	.59	1	0
SSW	.29	.69	7	14
SW	.32	.73	38	67
WSW	.19	.50	0	1
W	.20	.47	3	0
WNW	.19	.41	6	2
NW	.25	.46	28	10
NNW	.22	.41	1	1
N	.14	.26	0	0

LOCATION 14

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	SPR	SUM
NNE	.15	.33	0	0
NE	.19	.42	1	2
ENE	.29	.52	27	12
E	.26	.52	5	3
ESE	.25	.51	1	0
SE	.32	.69	1	2
SSE	.22	.55	0	0
S	.25	.59	1	1
SSW	.26	.63	1	8
SW	.23	.54	0	12
WSW	.21	.48	1	4
W	.18	.41	0	0
WNW	.19	.41	4	3
NW	.27	.50	43	32
NNW	.28	.52	16	21
N	.14	.27	0	0

LOCATION 15

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	SPR	SUM
NNE	.16	.43	0	0
NE	.25	.66	22	18
ENE	.15	.41	0	0
E	.16	.37	0	0
ESE	.16	.38	0	0
SE	.17	.39	0	0
SSE	.15	.34	0	0
S	.18	.50	0	0
SSW	.20	.52	0	3
SW	.15	.34	0	1
WSW	.15	.34	0	0
W	.14	.37	0	0
WNW	.15	.42	1	2
NW	.21	.53	11	11
NNW	.30	.65	64	62
N	.22	.53	1	2

TABLE E3-5

PEDESTRIAN LEVEL WIND TEST DATA

NO-BUILD

LOCATION 16

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	SPR	SUM
NNE	.22	.50	0	0
NE	.33	.65	24	19
ENE	.30	.61	14	6
E	.27	.51	2	2
ESE	.25	.50	0	0
SE	.31	.72	0	0
SSE	.32	.67	0	2
S	.18	.44	0	0
SSW	.26	.54	0	2
SW	.24	.50	0	7
WSW	.29	.55	4	15
W	.29	.54	18	16
WNW	.28	.53	35	26
NW	.22	.46	1	1
NNW	.25	.57	1	2
N	.21	.48	0	0

LOCATION 17

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	SPR	SUM
NNE	.34	.77	5	11
NE	.47	.84	75	51
ENE	.32	.62	12	8
E	.24	.52	0	1
ESE	.23	.46	0	0
SE	.28	.66	0	0
SSE	.17	.46	0	0
S	.14	.33	0	0
SSW	.25	.50	0	1
SW	.26	.54	0	8
WSW	.23	.50	0	1
W	.24	.53	0	1
WNW	.26	.51	7	11
NW	.24	.54	1	3
NNW	.20	.50	0	0
N	.23	.55	0	0

LOCATION 18

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	SPR	SUM
NNE	.24	.54	1	1
NE	.32	.66	27	20
ENE	.27	.55	11	4
E	.24	.50	1	1
ESE	.24	.49	0	0
SE	.27	.60	0	0
SSE	.34	.73	1	3
S	.19	.43	0	0
SSW	.26	.54	0	4
SW	.25	.51	0	12
WSW	.28	.53	5	16
W	.27	.52	15	12
WNW	.27	.55	38	26
NW	.20	.41	0	1
NNW	.23	.53	0	2
N	.18	.42	0	0

BUILD

LOCATION 16

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	SPR	SUM
NNE	.24	.47	1	2
NE	.30	.56	19	16
ENE	.36	.56	46	24
E	.31	.57	8	5
ESE	.27	.52	0	0
SE	.32	.61	0	0
SSE	.22	.53	0	0
S	.23	.57	0	0
SSW	.22	.51	0	0
SW	.25	.55	0	12
WSW	.29	.59	6	21
W	.26	.50	9	8
WNW	.23	.44	10	9
NW	.20	.43	0	1
NNW	.22	.44	0	1
N	.19	.34	0	0

LOCATION 17

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	SPR	SUM
NNE	.41	.71	10	10
NE	.41	.80	29	19
ENE	.39	.69	22	7
E	.26	.51	0	0
ESE	.22	.43	0	0
SE	.27	.54	0	0
SSE	.21	.56	0	0
S	.42	.78	6	6
SSW	.44	.83	12	33
SW	.30	.65	0	6
WSW	.27	.59	0	1
W	.23	.45	0	0
WNW	.27	.47	4	3
NW	.33	.59	13	9
NNW	.28	.50	0	0
N	.38	.64	3	3

LOCATION 18

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	SPR	SUM
NNE	.14	.25	2	2
NE	.15	.35	12	8
ENE	.15	.29	11	2
E	.14	.28	3	1
ESE	.14	.25	0	0
SE	.15	.31	0	0
SSE	.16	.37	0	1
S	.18	.42	7	5
SSW	.18	.40	10	23
SW	.16	.35	6	27
WSW	.14	.29	3	6
W	.14	.23	8	3
WNW	.14	.22	24	10
NW	.14	.24	11	5
NNW	.14	.27	2	3
N	.14	.25	1	0

TABLE E3-6

PEDESTRIAN LEVEL WIND TEST DATA

NO-BUILD

LOCATION 19

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	SPR	SUM
NNE	.21	.55	0	0
NE	.42	.80	67	46
ENE	.32	.67	19	12
E	.23	.52	0	1
ESE	.21	.47	0	0
SE	.28	.62	0	0
SSE	.31	.66	0	2
S	.18	.44	0	0
SSW	.25	.53	0	2
SW	.24	.51	0	8
WSW	.26	.52	1	9
W	.27	.53	8	12
WNW	.23	.48	4	7
NW	.19	.42	0	0
NNW	.19	.44	0	0
N	.17	.43	0	0

LOCATION 20

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	SPR	SUM
NNE	.21	.51	0	1
NE	.39	.72	67	46
ENE	.30	.62	20	13
E	.22	.49	0	1
ESE	.21	.44	0	0
SE	.28	.61	0	0
SSE	.31	.66	0	2
S	.20	.45	0	0
SSW	.23	.49	0	2
SW	.21	.48	0	5
WSW	.23	.49	1	7
W	.25	.51	7	11
WNW	.22	.46	5	8
NW	.18	.42	0	0
NNW	.21	.50	0	1
N	.19	.49	0	0

LOCATION 21

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	SPR	SUM
NNE	.25	.56	0	1
NE	.24	.58	1	3
ENE	.19	.54	0	0
E	.29	.74	2	2
ESE	.39	.87	6	5
SE	.48	.87	5	12
SSE	.29	.61	0	1
S	.13	.28	0	0
SSW	.14	.30	0	0
SW	.15	.36	0	0
WSW	.15	.33	0	0
W	.19	.43	0	0
WNW	.32	.56	50	37
NW	.32	.64	29	26
NNW	.32	.69	5	11
N	.34	.70	3	5

BUILD

LOCATION 19

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	SPR	SUM
NNE	.22	.46	0	0
NE	.27	.54	6	5
ENE	.35	.56	36	10
E	.33	.63	9	3
ESE	.21	.50	0	0
SE	.24	.50	0	0
SSE	.20	.54	0	0
S	.29	.69	1	0
SSW	.38	.74	16	30
SW	.31	.69	5	22
WSW	.34	.65	15	25
W	.27	.50	10	3
WNW	.21	.39	2	1
NW	.21	.43	0	0
NNW	.20	.43	0	0
N	.17	.38	0	0

LOCATION 20

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	SPR	SUM
NNE	.19	.42	0	0
NE	.27	.59	20	12
ENE	.30	.59	37	11
E	.25	.60	4	2
ESE	.19	.38	0	0
SE	.24	.52	0	0
SSE	.19	.43	0	0
S	.27	.58	3	1
SSW	.34	.65	22	39
SW	.26	.57	5	22
WSW	.26	.53	7	14
W	.19	.39	1	0
WNW	.16	.32	0	0
NW	.17	.37	0	0
NNW	.17	.36	0	0
N	.15	.35	0	0

LOCATION 21

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	SPR	SUM
NNE	.23	.56	2	2
NE	.21	.53	3	4
ENE	.20	.49	3	0
E	.29	.62	14	6
ESE	.35	.73	21	16
SE	.48	.81	26	48
SSE	.29	.64	1	2
S	.15	.37	0	0
SSW	.20	.48	0	1
SW	.19	.44	0	2
WSW	.17	.37	0	0
W	.17	.36	0	0
WNW	.21	.44	13	7
NW	.23	.54	13	9
NNW	.16	.43	0	0
N	.25	.57	2	2

TABLE E3-7

PEDESTRIAN LEVEL WIND TEST DATA

NO-BUILD

LOCATION 22

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	SPR	SUM
NNE	.21	.49	0	1
NE	.31	.61	41	26
ENE	.22	.50	6	1
E	.21	.46	1	1
ESE	.23	.50	0	0
SE	.19	.49	0	0
SSE	.18	.48	0	0
S	.18	.42	0	0
SSW	.17	.37	0	0
SW	.22	.52	0	10
WSW	.25	.53	5	17
W	.24	.50	15	11
WNW	.20	.45	9	7
NW	.23	.48	13	11
NNW	.26	.55	8	12
N	.22	.54	0	1

LOCATION 23

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	SPR	SUM
NNE	.24	.49	2	4
NE	.24	.49	12	11
ENE	.22	.50	6	1
E	.20	.50	1	1
ESE	.25	.57	1	0
SE	.31	.58	1	2
SSE	.30	.63	1	3
S	.24	.55	1	1
SSW	.18	.47	0	0
SW	.17	.43	0	1
WSW	.25	.56	6	17
W	.19	.43	1	1
WNW	.22	.51	27	17
NW	.24	.51	21	17
NNW	.24	.55	6	9
N	.30	.55	13	13

LOCATION 24

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	SPR	SUM
NNE	.19	.40	0	0
NE	.32	.53	15	8
ENE	.24	.42	1	0
E	.20	.40	0	0
ESE	.27	.51	0	0
SE	.28	.53	0	0
SSE	.34	.68	0	1
S	.27	.56	0	0
SSW	.26	.57	0	0
SW	.41	.76	46	68
WSW	.35	.67	15	17
W	.31	.61	20	5
WNW	.23	.49	3	1
NW	.22	.42	0	0
NNW	.22	.42	0	0
N	.19	.41	0	0

BUILD

LOCATION 22

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	SPR	SUM
NNE	.22	.51	0	0
NE	.21	.47	2	2
ENE	.27	.48	17	2
E	.21	.43	1	0
ESE	.22	.45	0	0
SE	.19	.45	0	0
SSE	.19	.49	0	0
S	.18	.43	0	0
SSW	.35	.72	23	26
SW	.33	.69	34	51
WSW	.30	.65	17	18
W	.22	.46	3	0
WNW	.18	.36	2	0
NW	.19	.38	1	0
NNW	.19	.42	0	0
N	.23	.55	1	0

LOCATION 23

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	SPR	SUM
NNE	.18	.46	0	1
NE	.17	.38	1	2
ENE	.18	.42	2	0
E	.16	.41	0	0
ESE	.23	.56	1	0
SE	.26	.58	0	1
SSE	.34	.64	5	8
S	.21	.54	1	1
SSW	.18	.44	0	1
SW	.17	.42	0	2
WSW	.20	.47	1	5
W	.17	.40	1	0
WNW	.18	.42	9	7
NW	.23	.56	35	25
NNW	.24	.56	10	14
N	.33	.62	34	32

LOCATION 24

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	SPR	SUM
NNE	.20	.41	0	0
NE	.22	.42	5	3
ENE	.22	.41	6	0
E	.15	.33	0	0
ESE	.18	.42	0	0
SE	.21	.47	0	0
SSE	.28	.56	1	1
S	.30	.66	7	2
SSW	.40	.76	74	74
SW	.27	.71	7	19
WSW	.19	.46	0	0
W	.16	.34	0	0
WNW	.15	.32	0	0
NW	.19	.36	1	0
NNW	.16	.32	0	0
N	.17	.34	0	0

TABLE E3-8

PEDESTRIAN LEVEL WIND TEST DATA

NO-BUILD

LOCATION 25

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	SPR	SUM
NNE	.21	.58	1	1
NE	.19	.52	2	3
ENE	.16	.35	0	0
E	.14	.30	0	0
ESE	.14	.31	0	0
SE	.15	.45	0	0
SSE	.18	.48	0	0
S	.15	.37	0	0
SSW	.19	.43	0	0
SW	.22	.50	1	12
WSW	.21	.47	1	4
W	.21	.49	4	2
WNW	.23	.54	35	22
NW	.23	.57	14	12
NNW	.30	.62	34	34
N	.29	.68	9	10

LOCATION 26

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	SPR	SUM
NNE	.27	.70	2	1
NE	.33	.71	25	13
ENE	.29	.66	13	2
E	.22	.51	0	0
ESE	.20	.43	0	0
SE	.15	.36	0	0
SSE	.16	.37	0	0
S	.14	.33	0	0
SSW	.26	.51	0	1
SW	.35	.65	23	49
WSW	.35	.61	21	29
W	.29	.59	16	5
WNW	.19	.46	0	0
NW	.18	.46	0	0
NNW	.18	.45	0	0
N	.22	.57	0	0

LOCATION 27

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	SPR	SUM
NNE	.24	.58	0	1
NE	.24	.54	3	4
ENE	.21	.50	1	0
E	.21	.50	0	0
ESE	.24	.52	0	0
SE	.29	.60	0	0
SSE	.24	.52	0	0
S	.23	.53	0	0
SSW	.20	.55	0	0
SW	.28	.64	2	22
WSW	.21	.48	0	1
W	.23	.48	2	1
WNW	.26	.59	23	14
NW	.28	.60	20	14
NNW	.37	.68	46	41
N	.29	.66	2	2

BUILD

LOCATION 25

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	SPR	SUM
NNE	.29	.62	1	5
NE	.51	.81	91	70
ENE	.30	.59	6	6
E	.31	.57	2	5
ESE	.20	.45	0	0
SE	.27	.56	0	0
SSE	.28	.60	0	1
S	.20	.40	0	0
SSW	.28	.51	0	7
SW	.20	.45	0	1
WSW	.15	.29	0	0
W	.14	.24	0	0
WNW	.14	.27	0	0
NW	.15	.29	0	0
NNW	.22	.53	0	1
N	.29	.63	0	3

LOCATION 26

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	SPR	SUM
NNE	.21	.53	3	5
NE	.18	.45	4	6
ENE	.17	.48	3	0
E	.18	.46	1	1
ESE	.19	.49	0	0
SE	.29	.58	2	4
SSE	.31	.63	4	7
S	.15	.34	0	0
SSW	.20	.39	0	4
SW	.15	.33	0	1
WSW	.14	.24	0	0
W	.14	.26	0	0
WNW	.16	.38	6	5
NW	.22	.48	39	27
NNW	.24	.58	18	21
N	.28	.63	19	19

LOCATION 27

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	SPR	SUM
NNE	.29	.64	1	3
NE	.22	.52	0	2
ENE	.17	.35	0	0
E	.19	.42	0	0
ESE	.19	.46	0	0
SE	.21	.44	0	0
SSE	.29	.61	0	1
S	.26	.54	0	0
SSW	.23	.49	0	0
SW	.21	.51	0	1
WSW	.17	.32	0	0
W	.17	.34	0	0
WNW	.20	.42	0	1
NW	.32	.58	30	26
NNW	.43	.71	69	67
N	.28	.61	0	1

TABLE E3-9

PEDESTRIAN LEVEL WIND TEST DATA

NO-BUILD

LOCATION 28

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	SPR	SUM
NNE	.34	.70	17	13
NE	.33	.66	35	19
ENE	.30	.61	23	6
E	.22	.49	0	0
ESE	.23	.51	0	0
SE	.25	.59	0	0
SSE	.23	.52	0	0
S	.18	.45	0	0
SSW	.29	.59	2	7
SW	.30	.56	9	36
WSW	.28	.52	7	14
W	.23	.46	3	1
WNW	.18	.45	1	1
NW	.19	.45	0	0
NNW	.25	.52	2	2
N	.25	.60	1	1

LOCATION 29

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	SPR	SUM
NNE	.19	.48	0	1
NE	.27	.61	32	21
ENE	.26	.60	30	11
E	.27	.72	15	7
ESE	.30	.70	11	8
SE	.20	.55	0	0
SSE	.21	.56	0	1
S	.19	.48	0	0
SSW	.24	.65	2	10
SW	.24	.59	6	34
WSW	.18	.46	0	2
W	.17	.37	1	0
WNW	.16	.40	1	1
NW	.18	.46	1	1
NNW	.14	.31	0	0
N	.14	.31	0	0

LOCATION 30

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	SPR	SUM
NNE	.14	.34	0	0
NE	.17	.40	5	6
ENE	.17	.46	6	1
E	.17	.43	2	1
ESE	.25	.60	11	8
SE	.20	.56	0	0
SSE	.28	.73	5	7
S	.18	.49	1	1
SSW	.20	.51	2	10
SW	.19	.47	3	23
WSW	.15	.40	0	2
W	.19	.51	22	14
WNW	.17	.43	31	18
NW	.17	.47	10	8
NNW	.15	.37	0	0
N	.13	.31	0	0

BUILD

LOCATION 28

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	SPR	SUM
NNE	.24	.59	1	3
NE	.20	.46	1	3
ENE	.20	.50	1	0
E	.28	.64	7	5
ESE	.33	.74	7	7
SE	.24	.56	0	0
SSE	.24	.51	0	1
S	.20	.42	0	0
SSW	.15	.25	0	0
SW	.15	.26	0	0
WSW	.15	.26	0	0
W	.17	.35	0	0
WNW	.19	.41	3	3
NW	.29	.61	55	43
NNW	.30	.66	18	25
N	.31	.68	8	11

LOCATION 29

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	SPR	SUM
NNE	.20	.47	0	0
NE	.33	.63	27	24
ENE	.22	.52	2	1
E	.31	.55	8	7
ESE	.30	.54	1	1
SE	.21	.47	0	0
SSE	.21	.40	0	0
S	.15	.30	0	0
SSW	.13	.24	0	0
SW	.14	.30	0	0
WSW	.18	.47	0	0
W	.24	.51	4	6
WNW	.29	.54	55	49
NW	.23	.50	2	6
NNW	.25	.57	1	5
N	.23	.53	0	0

LOCATION 30

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	SPR	SUM
NNE	.30	.65	1	4
NE	.45	.75	69	47
ENE	.31	.60	10	6
E	.23	.43	0	0
ESE	.18	.37	0	0
SE	.15	.28	0	0
SSE	.18	.35	0	0
S	.16	.31	0	0
SSW	.16	.32	0	0
SW	.23	.45	0	3
WSW	.28	.53	1	10
W	.29	.52	8	11
WNW	.26	.51	10	14
NW	.22	.41	0	1
NNW	.19	.43	0	0
N	.23	.62	0	0

TABLE E3-10

PEDESTRIAN LEVEL WIND TEST DATA

NO-BUILD

LOCATION 31

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	SPR	SUM
NNE	.17	.40	0	0
NE	.16	.34	0	1
ENE	.18	.41	2	0
E	.16	.40	0	0
ESE	.17	.42	0	0
SE	.16	.44	0	0
SSE	.18	.47	0	0
S	.15	.38	0	0
SSW	.20	.52	0	1
SW	.22	.54	1	18
WSW	.20	.49	1	4
W	.19	.43	3	2
WNW	.25	.52	74	47
NW	.19	.44	4	4
NNW	.26	.53	15	20
N	.16	.37	0	0

LOCATION 32

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	SPR	SUM
NNE	.21	.49	1	3
NE	.25	.57	17	17
ENE	.26	.56	24	12
E	.27	.64	10	7
ESE	.27	.61	2	2
SE	.22	.55	0	0
SSE	.20	.51	0	0
S	.13	.29	0	0
SSW	.15	.33	0	0
SW	.16	.36	0	1
WSW	.15	.34	0	0
W	.13	.29	0	0
WNW	.14	.40	0	0
NW	.21	.54	6	9
NNW	.30	.64	39	47
N	.18	.48	0	0

LOCATION 0

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	SPR	SUM
NNE	.00	.00	0	0
NE	.00	.00	0	0
ENE	.00	.00	0	0
E	.00	.00	0	0
ESE	.00	.00	0	0
SE	.00	.00	0	0
SSE	.00	.00	0	0
S	.00	.00	0	0
SSW	.00	.00	0	0
SW	.00	.00	0	0
WSW	.00	.00	0	0
W	.00	.00	0	0
WNW	.00	.00	0	0
NW	.00	.00	0	0
NNW	.00	.00	0	0
N	.00	.00	0	0

BUILD

LOCATION 31

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	SPR	SUM
NNE	.20	.52	5	7
NE	.19	.51	13	13
ENE	.15	.38	3	1
E	.14	.31	0	0
ESE	.14	.28	0	0
SE	.13	.24	0	0
SSE	.13	.23	0	0
S	.13	.22	0	0
SSW	.13	.23	0	0
SW	.14	.29	0	3
WSW	.16	.34	1	5
W	.16	.38	6	6
WNW	.19	.41	51	36
NW	.17	.41	13	13
NNW	.19	.45	6	11
N	.19	.46	2	3

LOCATION 32

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	SPR	SUM
NNE	.18	.40	0	1
NE	.22	.57	16	12
ENE	.22	.58	19	5
E	.20	.43	3	1
ESE	.20	.51	0	0
SE	.20	.44	0	0
SSE	.22	.48	0	1
S	.16	.33	0	0
SSW	.21	.46	1	6
SW	.21	.44	3	21
WSW	.20	.42	4	10
W	.17	.35	2	1
WNW	.16	.36	4	3
NW	.21	.51	27	17
NNW	.24	.56	19	19
N	.20	.47	1	1

LOCATION 33

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	SPR	SUM
NNE	.23	.50	0	0
NE	.33	.61	9	11
ENE	.37	.67	20	9
E	.27	.52	0	0
ESE	.27	.53	0	0
SE	.37	.75	0	0
SSE	.27	.68	0	0
S	.37	.88	3	4
SSW	.35	.79	1	11
SW	.24	.60	0	2
WSW	.24	.54	0	1
W	.25	.51	0	0
WNW	.29	.54	17	15
NW	.37	.63	46	38
NNW	.33	.59	4	8
N	.19	.41	0	0

TABLE E3-11

PEDESTRIAN LEVEL WIND TEST DATA

NO-BUILD

LOCATION 0

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	SPR	SUM
NNE	.00	.00	0	0
NE	.00	.00	0	0
ENE	.00	.00	0	0
E	.00	.00	0	0
ESE	.00	.00	0	0
SE	.00	.00	0	0
SSE	.00	.00	0	0
S	.00	.00	0	0
SSW	.00	.00	0	0
SW	.00	.00	0	0
WSW	.00	.00	0	0
W	.00	.00	0	0
WNW	.00	.00	0	0
NW	.00	.00	0	0
NNW	.00	.00	0	0
N	.00	.00	0	0

BUILD

LOCATION 34

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	SPR	SUM
NNE	.30	.70	1	2
NE	.37	.76	24	19
ENE	.38	.74	32	15
E	.27	.52	1	1
ESE	.23	.46	0	0
SE	.26	.53	0	0
SSE	.21	.54	0	0
S	.38	.81	5	6
SSW	.38	.81	6	26
SW	.23	.59	0	1
WSW	.21	.50	0	0
W	.19	.46	0	0
WNW	.24	.49	3	3
NW	.33	.62	28	23
NNW	.30	.58	1	4
N	.21	.54	0	0

TABLE E3-12

PEDESTRIAN LEVEL WIND TEST DATA

NO-BUILD

LOCATION 1

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	AUT	WIN
NNE	.24	.56	0	0
NE	.28	.55	5	1
ENE	.27	.54	4	2
E	.24	.47	0	0
ESE	.26	.62	0	0
SE	.32	.72	0	0
SSE	.22	.55	0	0
S	.28	.56	0	0
SSW	.30	.59	1	0
SW	.19	.46	0	0
WSW	.25	.50	0	0
W	.24	.48	0	0
WNW	.36	.59	53	68
NW	.34	.63	36	29
NNW	.19	.46	0	0
N	.21	.51	0	0

LOCATION 2

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	AUT	WIN
NNE	.32	.64	3	2
NE	.35	.63	22	11
ENE	.33	.56	15	12
E	.26	.51	1	0
ESE	.22	.47	0	0
SE	.23	.55	0	0
SSE	.22	.50	0	0
S	.24	.53	0	0
SSW	.34	.64	5	2
SW	.31	.68	6	3
WSW	.24	.49	0	0
W	.28	.61	3	4
WNW	.31	.54	24	43
NW	.30	.57	20	21
NNW	.22	.48	0	0
N	.28	.58	0	1

LOCATION 3

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	AUT	WIN
NNE	.22	.52	0	0
NE	.25	.52	1	0
ENE	.22	.45	0	0
E	.20	.44	0	0
ESE	.29	.55	0	0
SE	.36	.76	0	0
SSE	.29	.64	0	0
S	.30	.61	0	0
SSW	.31	.61	0	0
SW	.27	.55	0	0
WSW	.20	.46	0	0
W	.36	.67	8	3
WNW	.45	.75	85	96
NW	.30	.64	5	0
NNW	.21	.53	0	0
N	.27	.56	0	0

BUILD

LOCATION 1

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	AUT	WIN
NNE	.27	.60	4	1
NE	.28	.64	16	5
ENE	.26	.54	11	6
E	.17	.35	0	0
ESE	.22	.44	0	0
SE	.22	.45	0	0
SSE	.22	.44	0	0
S	.23	.47	1	0
SSW	.19	.44	0	0
SW	.17	.37	0	0
WSW	.23	.57	0	0
W	.20	.38	0	0
WNW	.31	.52	67	88
NW	.19	.41	2	0
NNW	.18	.40	0	0
N	.23	.50	0	1

LOCATION 2

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	AUT	WIN
NNE	.20	.43	0	0
NE	.17	.39	0	0
ENE	.31	.60	16	12
E	.22	.43	0	0
ESE	.25	.52	1	0
SE	.28	.54	0	0
SSE	.24	.50	0	0
S	.28	.62	2	1
SSW	.32	.62	5	2
SW	.32	.58	17	8
WSW	.29	.57	3	1
W	.27	.52	5	4
WNW	.31	.53	41	65
NW	.25	.54	9	5
NNW	.26	.59	1	1
N	.25	.49	0	1

LOCATION 3

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	AUT	WIN
NNE	.33	.75	12	5
NE	.24	.61	6	1
ENE	.21	.48	2	1
E	.16	.34	0	0
ESE	.15	.30	0	0
SE	.18	.41	0	0
SSE	.24	.57	0	0
S	.27	.63	2	1
SSW	.24	.56	1	0
SW	.20	.45	0	0
WSW	.18	.38	0	0
W	.18	.37	0	0
WNW	.30	.56	52	68
NW	.25	.46	17	8
NNW	.26	.58	3	1
N	.33	.71	7	14

TABLE E3-13

PEDESTRIAN LEVEL WIND TEST DATA

NO-BUILD

LOCATION 4

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	AUT	WIN
NNE	.29	.62	7	4
NE	.26	.54	14	7
ENE	.23	.53	7	6
E	.22	.52	1	1
ESE	.29	.54	3	1
SE	.35	.65	4	2
SSE	.29	.60	1	1
S	.27	.55	3	2
SSW	.31	.59	10	5
SW	.18	.41	0	0
WSW	.22	.50	1	0
W	.21	.43	1	1
WNW	.20	.46	3	4
NW	.28	.58	42	60
NNW	.23	.51	1	1
N	.26	.61	1	6

LOCATION 5

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	AUT	WIN
NNE	.19	.47	0	0
NE	.23	.51	0	0
ENE	.23	.51	0	0
E	.19	.42	0	0
ESE	.21	.46	0	0
SE	.27	.57	0	0
SSE	.24	.57	0	0
S	.23	.55	0	0
SSW	.24	.52	0	0
SW	.21	.48	0	0
WSW	.18	.41	0	0
W	.31	.62	1	0
WNW	.47	.80	92	100
NW	.32	.68	7	1
NNW	.22	.52	0	0
N	.27	.54	0	0

LOCATION 6

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	AUT	WIN
NNE	.17	.42	0	0
NE	.20	.47	0	0
ENE	.19	.46	0	0
E	.18	.39	0	0
ESE	.19	.44	0	0
SE	.24	.55	0	0
SSE	.21	.49	0	0
S	.20	.48	0	0
SSW	.22	.53	0	0
SW	.18	.44	0	0
WSW	.16	.36	0	0
W	.23	.52	0	0
WNW	.42	.76	96	101
NW	.27	.62	4	0
NNW	.20	.53	0	0
N	.25	.56	0	0

BUILD

LOCATION 4

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	AUT	WIN
NNE	.30	.69	16	13
NE	.26	.64	24	14
ENE	.22	.48	10	9
E	.16	.30	0	0
ESE	.16	.30	0	0
SE	.19	.42	0	0
SSE	.22	.52	0	0
S	.24	.52	2	2
SSW	.24	.47	3	2
SW	.27	.51	20	14
WSW	.23	.51	2	2
W	.21	.42	3	5
WNW	.19	.42	4	7
NW	.20	.47	10	9
NNW	.20	.44	0	1
N	.27	.60	4	18

LOCATION 5

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	AUT	WIN
NNE	.16	.32	0	0
NE	.14	.27	1	0
ENE	.16	.34	3	2
E	.14	.27	0	0
ESE	.15	.28	0	0
SE	.17	.39	0	0
SSE	.20	.44	0	0
S	.21	.48	3	2
SSW	.21	.44	3	1
SW	.21	.46	14	6
WSW	.18	.43	1	0
W	.19	.44	8	8
WNW	.20	.41	33	49
NW	.20	.39	28	26
NNW	.19	.38	4	3
N	.18	.36	0	2

LOCATION 6

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	AUT	WIN
NNE	.15	.33	1	0
NE	.15	.27	6	2
ENE	.17	.38	11	7
E	.15	.26	1	0
ESE	.15	.25	1	0
SE	.15	.26	0	0
SSE	.15	.28	0	0
S	.15	.31	1	0
SSW	.15	.29	1	0
SW	.17	.33	5	2
WSW	.17	.38	4	2
W	.18	.39	12	13
WNW	.18	.40	36	54
NW	.17	.36	21	17
NNW	.16	.31	2	1
N	.15	.26	0	1

TABLE E3-14

PEDESTRIAN LEVEL WIND TEST DATA

NO-BUILD

LOCATION 7

WIND ANGLE	RATIOS MEAN	RATIOS GUST	WEIGHT AUT	WEIGHT WIN
NNE	.19	.45	0	0
NE	.23	.53	7	2
ENE	.22	.50	5	3
E	.19	.41	0	0
ESE	.19	.41	0	0
SE	.25	.58	0	0
SSE	.19	.44	0	0
S	.25	.55	1	1
SSW	.30	.66	7	3
SW	.30	.61	21	9
WSW	.25	.56	2	1
W	.20	.45	0	0
WNW	.29	.59	54	82
NW	.18	.46	2	0
NNW	.17	.41	0	0
N	.22	.52	0	1

LOCATION 8

WIND ANGLE	RATIOS MEAN	RATIOS GUST	WEIGHT AUT	WEIGHT WIN
NNE	.18	.44	1	0
NE	.23	.51	20	10
ENE	.21	.49	12	10
E	.19	.47	1	1
ESE	.21	.50	2	0
SE	.23	.60	1	0
SSE	.21	.48	0	0
S	.22	.48	3	2
SSW	.26	.55	13	7
SW	.19	.42	2	1
WSW	.16	.30	0	0
W	.17	.36	1	1
WNW	.21	.50	29	55
NW	.19	.40	13	10
NNW	.17	.35	0	0
N	.19	.44	0	2

LOCATION 9

WIND ANGLE	RATIOS MEAN	RATIOS GUST	WEIGHT AUT	WEIGHT WIN
NNE	.25	.54	1	1
NE	.31	.62	22	14
ENE	.26	.56	9	9
E	.27	.53	3	2
ESE	.28	.55	2	0
SE	.34	.70	2	1
SSE	.19	.47	0	0
S	.26	.63	1	1
SSW	.31	.68	6	4
SW	.31	.63	16	13
WSW	.31	.59	10	10
W	.29	.53	13	26
WNW	.22	.46	3	6
NW	.24	.46	10	11
NNW	.16	.34	0	0
N	.19	.46	0	0

BUILD

LOCATION 7

WIND ANGLE	RATIOS MEAN	RATIOS GUST	WEIGHT AUT	WEIGHT WIN
NNE	.14	.34	0	0
NE	.16	.36	1	1
ENE	.16	.35	1	1
E	.15	.32	0	0
ESE	.17	.38	0	0
SE	.29	.56	2	2
SSE	.29	.61	2	2
S	.38	.69	31	36
SSW	.39	.68	61	50
SW	.19	.48	1	1
WSW	.15	.35	0	0
W	.16	.38	0	0
WNW	.17	.39	1	5
NW	.15	.31	1	1
NNW	.18	.36	0	0
N	.13	.27	0	0

LOCATION 8

WIND ANGLE	RATIOS MEAN	RATIOS GUST	WEIGHT AUT	WEIGHT WIN
NNE	.31	.63	8	8
NE	.38	.69	52	38
ENE	.22	.53	4	4
E	.17	.30	0	0
ESE	.21	.40	0	0
SE	.32	.56	2	1
SSE	.27	.53	0	0
S	.33	.55	7	8
SSW	.34	.57	14	12
SW	.27	.49	6	6
WSW	.19	.38	0	0
W	.19	.39	0	0
WNW	.19	.37	1	2
NW	.19	.34	1	1
NNW	.25	.45	1	4
N	.29	.50	2	15

LOCATION 9

WIND ANGLE	RATIOS MEAN	RATIOS GUST	WEIGHT AUT	WEIGHT WIN
NNE	.22	.49	2	2
NE	.20	.42	5	3
ENE	.26	.49	19	20
E	.24	.47	4	4
ESE	.25	.48	3	1
SE	.30	.60	3	2
SSE	.22	.51	0	0
S	.31	.68	10	12
SSW	.32	.70	22	17
SW	.27	.64	23	22
WSW	.21	.50	1	1
W	.19	.44	1	2
WNW	.18	.38	2	5
NW	.19	.38	6	6
NNW	.18	.36	0	0
N	.16	.36	0	0

TABLE E3-15

PEDESTRIAN LEVEL WIND TEST DATA

NO-BUILD

LOCATION 10

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	AUT	WIN
NNE	.19	.45	0	0
NE	.25	.54	11	5
ENE	.26	.54	13	11
E	.23	.47	1	1
ESE	.22	.47	1	0
SE	.29	.64	1	0
SSE	.17	.42	0	0
S	.20	.48	0	0
SSW	.27	.62	4	2
SW	.28	.59	14	9
WSW	.30	.58	17	15
W	.28	.53	21	34
WNW	.22	.46	9	15
NW	.21	.45	8	5
NNW	.16	.36	0	0
N	.21	.52	0	1

LOCATION 11

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	AUT	WIN
NNE	.20	.46	0	0
NE	.32	.67	21	10
ENE	.31	.62	17	12
E	.23	.47	0	0
ESE	.23	.44	0	0
SE	.20	.45	0	0
SSE	.16	.37	0	0
S	.16	.36	0	0
SSW	.16	.33	0	0
SW	.18	.39	0	0
WSW	.18	.44	0	0
W	.20	.48	0	0
WNW	.25	.52	8	10
NW	.32	.65	50	66
NNW	.28	.61	3	3
N	.18	.45	0	0

LOCATION 12

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	AUT	WIN
NNE	.19	.47	0	0
NE	.29	.63	12	4
ENE	.33	.65	21	15
E	.28	.50	2	1
ESE	.28	.48	1	0
SE	.24	.45	0	0
SSE	.24	.46	0	0
S	.17	.35	0	0
SSW	.18	.42	0	0
SW	.21	.46	0	0
WSW	.20	.48	0	0
W	.22	.54	0	0
WNW	.27	.56	12	15
NW	.33	.64	47	60
NNW	.30	.64	4	4
N	.18	.41	0	0

BUILD

LOCATION 10

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	AUT	WIN
NNE	.16	.45	0	0
NE	.16	.40	0	0
ENE	.25	.48	10	10
E	.24	.49	2	2
ESE	.26	.53	2	0
SE	.36	.68	5	3
SSE	.27	.60	0	1
S	.36	.76	15	15
SSW	.38	.71	39	27
SW	.20	.54	0	0
WSW	.16	.41	0	0
W	.18	.42	0	0
WNW	.22	.43	6	15
NW	.23	.39	14	18
NNW	.26	.46	4	8
N	.15	.41	0	0

LOCATION 11

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	AUT	WIN
NNE	.22	.48	0	0
NE	.25	.55	5	1
ENE	.24	.56	3	2
E	.18	.43	0	0
ESE	.19	.42	0	0
SE	.26	.52	0	0
SSE	.18	.46	0	0
S	.23	.62	0	0
SSW	.24	.59	0	0
SW	.17	.41	0	0
WSW	.18	.44	0	0
W	.18	.41	0	0
WNW	.23	.50	2	1
NW	.35	.68	58	69
NNW	.37	.71	31	27
N	.22	.50	0	0

LOCATION 12

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	AUT	WIN
NNE	.23	.53	0	0
NE	.32	.60	15	6
ENE	.30	.63	9	6
E	.25	.48	0	0
ESE	.26	.48	1	0
SE	.30	.51	0	0
SSE	.31	.58	0	0
S	.24	.53	0	0
SSW	.22	.52	0	0
SW	.18	.41	0	0
WSW	.21	.51	0	0
W	.20	.48	0	0
WNW	.26	.57	6	6
NW	.35	.66	48	61
NNW	.37	.70	21	22
N	.23	.53	0	0

TABLE E3-16

PEDESTRIAN LEVEL WIND TEST DATA

NO-BUILD

LOCATION 13

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	AUT	WIN
NNE	.25	.51	2	2
NE	.31	.63	30	18
ENE	.22	.48	4	3
E	.21	.47	0	0
ESE	.25	.57	1	0
SE	.24	.60	0	0
SSE	.19	.46	0	0
S	.25	.56	1	1
SSW	.26	.67	2	1
SW	.28	.65	13	9
WSW	.28	.61	6	6
W	.27	.50	16	27
WNW	.24	.47	13	26
NW	.22	.44	9	8
NNW	.14	.30	0	0
N	.16	.40	0	0

LOCATION 14

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	AUT	WIN
NNE	.21	.48	1	0
NE	.25	.55	13	5
ENE	.28	.55	20	15
E	.25	.51	3	1
ESE	.23	.47	1	0
SE	.30	.74	2	0
SSE	.22	.54	0	0
S	.19	.46	0	0
SSW	.21	.49	0	0
SW	.24	.53	3	1
WSW	.27	.56	8	5
W	.27	.53	18	25
WNW	.25	.53	25	42
NW	.21	.44	6	3
NNW	.17	.40	0	0
N	.20	.44	0	0

LOCATION 15

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	AUT	WIN
NNE	.19	.52	1	1
NE	.31	.66	58	41
ENE	.20	.56	9	9
E	.16	.37	0	0
ESE	.15	.37	0	0
SE	.15	.36	0	0
SSE	.14	.31	0	0
S	.14	.30	0	0
SSW	.21	.50	2	1
SW	.20	.47	3	2
WSW	.15	.37	0	0
W	.16	.39	0	0
WNW	.16	.41	1	3
NW	.21	.52	23	38
NNW	.20	.49	1	3
N	.16	.38	0	0

BUILD

LOCATION 13

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	AUT	WIN
NNE	.15	.32	0	0
NE	.20	.42	4	2
ENE	.24	.48	10	9
E	.23	.43	2	1
ESE	.24	.47	2	0
SE	.30	.59	2	1
SSE	.21	.56	0	0
S	.24	.59	1	1
SSW	.29	.69	9	6
SW	.32	.73	43	34
WSW	.19	.50	0	0
W	.20	.47	1	2
WNW	.19	.41	2	4
NW	.25	.46	25	39
NNW	.22	.41	1	1
N	.14	.26	0	0

LOCATION 14

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	AUT	WIN
NNE	.15	.33	0	0
NE	.19	.42	2	0
ENE	.29	.52	23	18
E	.26	.52	4	3
ESE	.25	.51	2	0
SE	.32	.69	3	1
SSE	.22	.55	0	0
S	.25	.59	2	1
SSW	.26	.63	3	1
SW	.23	.54	2	1
WSW	.21	.48	0	0
W	.18	.41	0	0
WNW	.19	.41	2	2
NW	.27	.50	41	55
NNW	.28	.52	14	16
N	.14	.27	0	0

LOCATION 15

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	AUT	WIN
NNE	.16	.43	0	0
NE	.25	.66	23	11
ENE	.15	.41	1	1
E	.16	.37	0	0
ESE	.16	.38	0	0
SE	.17	.39	0	0
SSE	.15	.34	0	0
S	.18	.50	0	0
SSW	.20	.52	1	0
SW	.15	.34	0	0
WSW	.15	.34	0	0
W	.14	.37	0	0
WNW	.15	.42	1	0
NW	.21	.53	17	15
NNW	.30	.65	56	68
N	.22	.53	1	5

TABLE E3-17

PEDESTRIAN LEVEL WIND TEST DATA

NO-BUILD

LOCATION 16

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	AUT	WIN
NNE	.22	.50	0	0
NE	.33	.65	27	14
ENE	.30	.61	16	12
E	.27	.51	3	2
ESE	.25	.50	1	0
SE	.31	.72	1	0
SSE	.32	.67	1	1
S	.18	.44	0	0
SSW	.26	.54	1	0
SW	.24	.50	1	0
WSW	.29	.55	4	3
W	.29	.54	14	19
WNW	.28	.53	26	45
NW	.22	.46	4	2
NNW	.25	.57	1	1
N	.21	.48	0	0

LOCATION 17

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	AUT	WIN
NNE	.34	.77	7	7
NE	.47	.84	65	48
ENE	.32	.62	15	16
E	.24	.52	0	0
ESE	.23	.46	0	0
SE	.28	.66	0	0
SSE	.17	.46	0	0
S	.14	.33	0	0
SSW	.25	.50	0	0
SW	.26	.54	1	1
WSW	.23	.50	0	0
W	.24	.53	0	1
WNW	.26	.51	6	17
NW	.24	.54	4	5
NNW	.20	.50	0	0
N	.23	.55	0	1

LOCATION 18

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	AUT	WIN
NNE	.24	.54	1	0
NE	.32	.66	29	15
ENE	.27	.55	13	10
E	.24	.50	1	1
ESE	.24	.49	1	0
SE	.27	.60	0	0
SSE	.34	.73	2	2
S	.19	.43	0	0
SSW	.26	.54	2	1
SW	.25	.51	3	1
WSW	.28	.53	5	3
W	.27	.52	11	15
WNW	.27	.55	27	48
NW	.20	.41	3	1
NNW	.23	.53	1	1
N	.18	.42	0	0

BUILD

LOCATION 16

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	AUT	WIN
NNE	.24	.47	1	1
NE	.30	.56	22	14
ENE	.36	.56	38	34
E	.31	.57	8	7
ESE	.27	.52	2	0
SE	.32	.61	2	1
SSE	.22	.53	0	0
S	.23	.57	1	1
SSW	.22	.51	0	0
SW	.25	.55	2	2
WSW	.29	.59	6	7
W	.26	.50	7	13
WNW	.23	.44	7	15
NW	.20	.43	3	2
NNW	.22	.44	0	1
N	.19	.34	0	0

LOCATION 17

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	AUT	WIN
NNE	.41	.71	9	7
NE	.41	.80	27	17
ENE	.39	.69	19	18
E	.26	.51	0	0
ESE	.22	.43	0	0
SE	.27	.54	0	0
SSE	.21	.56	0	0
S	.42	.78	6	6
SSW	.44	.83	14	10
SW	.30	.65	1	1
WSW	.27	.59	0	0
W	.23	.45	0	0
WNW	.27	.47	2	3
NW	.33	.59	18	24
NNW	.28	.50	0	0
N	.38	.64	2	12

LOCATION 18

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	AUT	WIN
NNE	.14	.25	2	1
NE	.15	.35	14	7
ENE	.15	.29	10	9
E	.14	.28	2	2
ESE	.14	.25	1	0
SE	.15	.31	0	0
SSE	.16	.37	0	0
S	.18	.42	7	6
SSW	.18	.40	12	8
SW	.16	.35	12	8
WSW	.14	.29	2	2
W	.14	.23	4	6
WNW	.14	.22	12	25
NW	.14	.24	16	17
NNW	.14	.27	2	3
N	.14	.25	0	3

TABLE E3-18

PEDESTRIAN LEVEL WIND TEST DATA

NO-BUILD

LOCATION 19

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	AUT	WIN
NNE	.21	.55	0	0
NE	.42	.80	62	44
ENE	.32	.67	21	21
E	.23	.52	1	1
ESE	.21	.47	0	0
SE	.28	.62	0	0
SSE	.31	.66	1	1
S	.18	.44	0	0
SSW	.25	.53	1	0
SW	.24	.51	1	1
WSW	.26	.52	1	2
W	.27	.53	7	17
WNW	.23	.48	4	10
NW	.19	.42	1	0
NNW	.19	.44	0	0
N	.17	.43	0	0

LOCATION 20

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	AUT	WIN
NNE	.21	.51	0	0
NE	.39	.72	61	44
ENE	.30	.62	21	22
E	.22	.49	1	1
ESE	.21	.44	0	0
SE	.28	.61	1	0
SSE	.31	.66	1	1
S	.20	.45	0	0
SSW	.23	.49	0	0
SW	.21	.48	0	0
WSW	.23	.49	1	1
W	.25	.51	6	16
WNW	.22	.46	4	11
NW	.18	.42	1	1
NNW	.21	.50	0	0
N	.19	.49	0	0

LOCATION 21

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	AUT	WIN
NNE	.25	.56	0	0
NE	.24	.58	3	1
ENE	.19	.54	0	0
E	.29	.74	2	1
ESE	.39	.87	6	2
SE	.48	.87	9	3
SSE	.29	.61	0	0
S	.13	.28	0	0
SSW	.14	.30	0	0
SW	.15	.36	0	0
WSW	.15	.33	0	0
W	.19	.43	0	0
WNW	.32	.56	35	48
NW	.32	.64	35	33
NNW	.32	.69	6	4
N	.34	.70	3	8

BUILD

LOCATION 19

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	AUT	WIN
NNE	.22	.46	0	0
NE	.27	.54	9	5
ENE	.35	.56	29	28
E	.33	.63	7	7
ESE	.21	.50	0	0
SE	.24	.50	0	0
SSE	.20	.54	0	0
S	.29	.69	2	2
SSW	.38	.74	18	14
SW	.31	.69	11	9
WSW	.34	.65	15	18
W	.27	.50	6	12
WNW	.21	.39	1	2
NW	.21	.43	2	1
NNW	.20	.43	0	0
N	.17	.38	0	0

LOCATION 20

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	AUT	WIN
NNE	.19	.42	0	0
NE	.27	.59	21	15
ENE	.30	.59	29	30
E	.25	.60	4	4
ESE	.19	.38	0	0
SE	.24	.52	0	0
SSE	.19	.43	0	0
S	.27	.58	3	4
SSW	.34	.65	23	19
SW	.26	.57	10	11
WSW	.26	.53	6	10
W	.19	.39	0	1
WNW	.16	.32	0	0
NW	.17	.37	1	1
NNW	.17	.36	0	0
N	.15	.35	0	0

LOCATION 21

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	AUT	WIN
NNE	.23	.56	3	2
NE	.21	.53	7	3
ENE	.20	.49	5	4
E	.29	.62	12	10
ESE	.35	.73	13	8
SE	.48	.81	28	18
SSE	.29	.64	1	1
S	.15	.37	0	0
SSW	.20	.48	0	0
SW	.19	.44	0	0
WSW	.17	.37	0	0
W	.17	.36	0	0
WNW	.21	.44	8	15
NW	.23	.54	21	26
NNW	.16	.43	0	0
N	.25	.57	2	10

TABLE E3-19

PEDESTRIAN LEVEL WIND TEST DATA

NO-BUILD

LOCATION 22

WIND ANGLE	RATIOS MEAN	RATIOS GUST	WEIGHT AUT	WEIGHT WIN
NNE	.21	.49	1	0
NE	.31	.61	37	23
ENE	.22	.50	7	6
E	.21	.46	1	0
ESE	.23	.50	1	0
SE	.19	.49	0	0
SSE	.18	.48	0	0
S	.18	.42	0	0
SSW	.17	.37	0	0
SW	.22	.52	2	1
WSW	.25	.53	5	4
W	.24	.50	10	16
WNW	.20	.45	5	9
NW	.23	.48	20	24
NNW	.26	.55	7	11
N	.22	.54	0	2

LOCATION 23

WIND ANGLE	RATIOS MEAN	RATIOS GUST	WEIGHT AUT	WEIGHT WIN
NNE	.24	.49	3	1
NE	.24	.49	15	6
ENE	.22	.50	7	5
E	.20	.50	1	0
ESE	.25	.57	3	0
SE	.31	.58	3	1
SSE	.30	.63	2	1
S	.24	.55	2	1
SSW	.18	.47	0	0
SW	.17	.43	0	0
WSW	.25	.56	5	3
W	.19	.43	1	1
WNW	.22	.51	16	22
NW	.24	.51	26	26
NNW	.24	.55	5	5
N	.30	.55	10	24

LOCATION 24

WIND ANGLE	RATIOS MEAN	RATIOS GUST	WEIGHT AUT	WEIGHT WIN
NNE	.19	.40	0	0
NE	.32	.53	16	10
ENE	.24	.42	2	2
E	.20	.40	0	0
ESE	.27	.51	1	0
SE	.28	.53	0	0
SSE	.34	.68	1	1
S	.27	.56	1	1
SSW	.26	.57	0	0
SW	.41	.76	53	46
WSW	.35	.67	12	15
W	.31	.61	11	22
WNW	.23	.49	1	2
NW	.22	.42	2	1
NNW	.22	.42	0	0
N	.19	.41	0	0

BUILD

LOCATION 22

WIND ANGLE	RATIOS MEAN	RATIOS GUST	WEIGHT AUT	WEIGHT WIN
NNE	.22	.51	1	1
NE	.21	.47	4	2
ENE	.27	.48	14	15
E	.21	.43	1	0
ESE	.22	.45	1	0
SE	.19	.45	0	0
SSE	.19	.49	0	0
S	.18	.43	0	0
SSW	.35	.72	21	16
SW	.33	.69	41	37
WSW	.30	.65	14	18
W	.22	.46	1	3
WNW	.18	.36	1	1
NW	.19	.38	3	2
NNW	.19	.42	0	0
N	.23	.55	0	4

LOCATION 23

WIND ANGLE	RATIOS MEAN	RATIOS GUST	WEIGHT AUT	WEIGHT WIN
NNE	.18	.46	0	0
NE	.17	.38	3	0
ENE	.18	.42	3	2
E	.16	.41	0	0
ESE	.23	.56	3	0
SE	.26	.58	2	0
SSE	.34	.64	5	4
S	.21	.54	1	1
SSW	.18	.44	0	0
SW	.17	.42	0	0
WSW	.20	.47	1	0
W	.17	.40	0	0
WNW	.18	.42	5	4
NW	.23	.56	36	33
NNW	.24	.56	9	7
N	.33	.62	30	46

LOCATION 24

WIND ANGLE	RATIOS MEAN	RATIOS GUST	WEIGHT AUT	WEIGHT WIN
NNE	.20	.41	0	1
NE	.22	.42	8	6
ENE	.22	.41	7	10
E	.15	.33	0	0
ESE	.18	.42	0	0
SE	.21	.47	0	0
SSE	.28	.56	1	2
S	.30	.66	7	10
SSW	.40	.76	57	47
SW	.27	.71	15	19
WSW	.19	.46	0	0
W	.16	.34	0	0
WNW	.15	.32	0	0
NW	.19	.36	3	4
NNW	.16	.32	0	0
N	.17	.34	0	0

TABLE E3-20

PEDESTRIAN LEVEL WIND TEST DATA

	NO-BUILD				BUILD			
	LOCATION 25				LOCATION 25			
WIND	RATIOS		WEIGHT		RATIOS		WEIGHT	
ANGLE	MEAN	GUST	AUT	WIN	MEAN	GUST	AUT	WIN
NNE	.21	.58	1	0	.29	.62	2	3
NE	.19	.52	4	1	.51	.81	82	67
ENE	.16	.35	1	0	.30	.59	10	14
E	.14	.30	0	0	.31	.57	4	6
ESE	.14	.31	0	0	.20	.45	0	0
SE	.15	.45	0	0	.27	.56	0	0
SSE	.18	.48	0	0	.28	.60	0	0
S	.15	.37	0	0	.20	.40	0	0
SSW	.19	.43	0	0	.28	.51	1	1
SW	.22	.50	3	1	.20	.45	0	0
WSW	.21	.47	1	0	.15	.29	0	0
W	.21	.49	3	2	.14	.24	0	0
WNW	.23	.54	24	30	.14	.27	0	0
NW	.23	.57	23	17	.15	.29	0	0
NNW	.30	.62	33	31	.22	.53	0	0
N	.29	.68	8	18	.29	.63	0	8

	LOCATION 26				LOCATION 26			
WIND	RATIOS		WEIGHT		RATIOS		WEIGHT	
ANGLE	MEAN	GUST	AUT	WIN	MEAN	GUST	AUT	WIN
NNE	.27	.70	2	2	.21	.53	4	2
NE	.33	.71	23	15	.18	.45	7	2
ENE	.29	.66	12	12	.17	.48	4	2
E	.22	.51	0	0	.18	.46	1	0
ESE	.20	.43	0	0	.19	.49	1	0
SE	.15	.36	0	0	.29	.58	5	2
SSE	.16	.37	0	0	.31	.63	5	4
S	.14	.33	0	0	.15	.34	0	0
SSW	.26	.51	1	0	.20	.39	2	1
SW	.35	.65	32	27	.15	.33	0	0
WSW	.35	.61	20	24	.14	.24	0	0
W	.29	.59	9	18	.14	.26	0	0
WNW	.19	.46	0	0	.16	.38	3	2
NW	.18	.46	0	0	.22	.48	38	41
NNW	.18	.45	0	0	.24	.58	15	14
N	.22	.57	0	0	.28	.63	16	30

	LOCATION 27				LOCATION 27			
WIND	RATIOS		WEIGHT		RATIOS		WEIGHT	
ANGLE	MEAN	GUST	AUT	WIN	MEAN	GUST	AUT	WIN
NNE	.24	.58	1	0	.29	.64	2	1
NE	.24	.54	5	2	.22	.52	2	0
ENE	.21	.50	2	1	.17	.35	0	0
E	.21	.50	0	0	.19	.42	0	0
ESE	.24	.52	1	0	.19	.46	0	0
SE	.29	.60	0	0	.21	.44	0	0
SSE	.24	.52	0	0	.29	.61	0	0
S	.23	.53	0	0	.26	.54	1	0
SSW	.20	.55	0	0	.23	.49	0	0
SW	.28	.64	7	3	.21	.51	0	0
WSW	.21	.48	0	0	.17	.32	0	0
W	.23	.48	1	1	.17	.34	0	0
WNW	.26	.59	14	18	.20	.42	0	0
NW	.28	.60	26	25	.32	.58	34	33
NNW	.37	.68	40	44	.43	.71	62	64
N	.29	.66	1	5	.28	.61	0	2

TABLE E3-21

PEDESTRIAN LEVEL WIND TEST DATA

NO-BUILD

LOCATION 28

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	AUT	WIN
NNE	.34	.70	14	14
NE	.33	.66	32	22
ENE	.30	.61	19	20
E	.22	.49	1	0
ESE	.23	.51	1	0
SE	.25	.59	0	0
SSE	.23	.52	0	0
S	.18	.45	0	0
SSW	.29	.59	4	4
SW	.30	.56	16	16
WSW	.28	.52	5	7
W	.23	.46	2	4
WNW	.18	.45	0	1
NW	.19	.45	2	1
NNW	.25	.52	1	4
N	.25	.60	0	5

LOCATION 29

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	AUT	WIN
NNE	.19	.48	1	1
NE	.27	.61	30	23
ENE	.26	.60	25	27
E	.27	.72	12	14
ESE	.30	.70	8	6
SE	.20	.55	0	0
SSE	.21	.56	0	0
S	.19	.48	0	1
SSW	.24	.65	5	4
SW	.24	.59	12	14
WSW	.18	.46	0	0
W	.17	.37	1	2
WNW	.16	.40	1	2
NW	.18	.46	5	5
NNW	.14	.31	0	0
N	.14	.31	0	0

LOCATION 30

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	AUT	WIN
NNE	.14	.34	0	0
NE	.17	.40	8	3
ENE	.17	.46	7	6
E	.17	.43	2	1
ESE	.25	.60	9	4
SE	.20	.56	1	0
SSE	.28	.73	5	5
S	.18	.49	2	1
SSW	.20	.51	5	3
SW	.19	.47	8	4
WSW	.15	.40	0	0
W	.19	.51	15	22
WNW	.17	.43	20	34
NW	.17	.47	17	16
NNW	.15	.37	0	0
N	.13	.31	0	0

BUILD

LOCATION 28

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	AUT	WIN
NNE	.24	.59	2	1
NE	.20	.46	3	1
ENE	.20	.50	3	1
E	.28	.64	7	3
ESE	.33	.74	7	2
SE	.24	.56	0	0
SSE	.24	.51	0	0
S	.20	.42	0	0
SSW	.15	.25	0	0
SW	.15	.26	0	0
WSW	.15	.26	0	0
W	.17	.35	0	0
WNW	.19	.41	2	1
NW	.29	.61	52	61
NNW	.30	.66	17	15
N	.31	.68	7	16

LOCATION 29

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	AUT	WIN
NNE	.20	.47	0	0
NE	.33	.63	30	14
ENE	.22	.52	3	2
E	.31	.55	8	5
ESE	.30	.54	3	1
SE	.21	.47	0	0
SSE	.21	.40	0	0
S	.15	.30	0	0
SSW	.13	.24	0	0
SW	.14	.30	0	0
WSW	.18	.47	0	0
W	.24	.51	3	3
WNW	.29	.54	41	68
NW	.23	.50	9	4
NNW	.25	.57	1	1
N	.23	.53	0	1

LOCATION 30

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	AUT	WIN
NNE	.30	.65	3	2
NE	.45	.75	63	43
ENE	.31	.60	13	13
E	.23	.43	0	0
ESE	.18	.37	0	0
SE	.15	.28	0	0
SSE	.18	.35	0	0
S	.16	.31	0	0
SSW	.16	.32	0	0
SW	.23	.45	0	0
WSW	.28	.53	1	1
W	.29	.52	7	15
WNW	.26	.51	9	21
NW	.22	.41	2	1
NNW	.19	.43	0	0
N	.23	.62	0	1

TABLE E3-22

PEDESTRIAN LEVEL WIND TEST DATA

NO-BUILD

LOCATION 31

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	AUT	WIN
NNE	.17	.40	0	0
NE	.16	.34	2	0
ENE	.18	.41	4	2
E	.16	.40	0	0
ESE	.17	.42	0	0
SE	.16	.44	0	0
SSE	.18	.47	0	0
S	.15	.38	0	0
SSW	.20	.52	1	0
SW	.22	.54	6	1
WSW	.20	.49	1	0
W	.19	.43	2	1
WNW	.25	.52	57	78
NW	.19	.44	11	4
NNW	.26	.53	17	13
N	.16	.37	0	0

LOCATION 32

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	AUT	WIN
NNE	.21	.49	1	1
NE	.25	.57	19	11
ENE	.26	.56	21	19
E	.27	.64	8	7
ESE	.27	.61	4	1
SE	.22	.55	0	0
SSE	.20	.51	0	0
S	.13	.29	0	0
SSW	.15	.33	0	0
SW	.16	.36	0	0
WSW	.15	.34	0	0
W	.13	.29	0	0
WNW	.14	.40	0	0
NW	.21	.54	12	12
NNW	.30	.64	34	49
N	.18	.48	0	0

LOCATION 0

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	AUT	WIN
NNE	.00	.00	0	0
NE	.00	.00	0	0
ENE	.00	.00	0	0
E	.00	.00	0	0
ESE	.00	.00	0	0
SE	.00	.00	0	0
SSE	.00	.00	0	0
S	.00	.00	0	0
SSW	.00	.00	0	0
SW	.00	.00	0	0
WSW	.00	.00	0	0
W	.00	.00	0	0
WNW	.00	.00	0	0
NW	.00	.00	0	0
NNW	.00	.00	0	0
N	.00	.00	0	0

BUILD

LOCATION 31

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	AUT	WIN
NNE	.20	.52	6	3
NE	.19	.51	17	7
ENE	.15	.38	5	3
E	.14	.31	0	0
ESE	.14	.28	0	0
SE	.13	.24	0	0
SSE	.13	.23	0	0
S	.13	.22	0	0
SSW	.13	.23	0	0
SW	.14	.29	0	0
WSW	.16	.34	1	0
W	.16	.38	5	4
WNW	.19	.41	36	54
NW	.17	.41	21	17
NNW	.19	.45	6	6
N	.19	.46	2	7

LOCATION 32

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	AUT	WIN
NNE	.18	.40	1	0
NE	.22	.57	17	9
ENE	.22	.58	16	14
E	.20	.43	2	2
ESE	.20	.51	2	0
SE	.20	.44	0	0
SSE	.22	.48	0	0
S	.16	.33	0	0
SSW	.21	.46	3	1
SW	.21	.44	6	4
WSW	.20	.42	3	2
W	.17	.35	1	1
WNW	.16	.36	2	3
NW	.21	.51	29	38
NNW	.24	.56	15	21
N	.20	.47	0	3

LOCATION 33

WIND	RATIOS		WEIGHT	
ANGLE	MEAN	GUST	AUT	WIN
NNE	.23	.50	0	0
NE	.33	.61	12	5
ENE	.37	.67	19	14
E	.27	.52	1	0
ESE	.27	.53	0	0
SE	.37	.75	1	0
SSE	.27	.68	0	0
S	.37	.88	4	3
SSW	.35	.79	4	2
SW	.24	.60	0	0
WSW	.24	.54	0	0
W	.25	.51	0	0
WNW	.29	.54	10	13
NW	.37	.63	45	59
NNW	.33	.59	3	3
N	.19	.41	0	0

TABLE E3-23

PEDESTRIAN LEVEL WIND TEST DATA

NO-BUILD

LOCATION 0

WIND ANGLE	RATIOS MEAN	GUST	WEIGHT AUT	WIN
NNE	.00	.00	0	0
NE	.00	.00	0	0
ENE	.00	.00	0	0
E	.00	.00	0	0
ESE	.00	.00	0	0
SE	.00	.00	0	0
SSE	.00	.00	0	0
S	.00	.00	0	0
SSW	.00	.00	0	0
SW	.00	.00	0	0
WSW	.00	.00	0	0
W	.00	.00	0	0
WNW	.00	.00	0	0
NW	.00	.00	0	0
NNW	.00	.00	0	0
N	.00	.00	0	0

BUILD

LOCATION 34

WIND ANGLE	RATIOS MEAN	GUST	WEIGHT AUT	WIN
NNE	.30	.70	2	1
NE	.37	.76	24	14
ENE	.38	.74	26	23
E	.27	.52	1	0
ESE	.23	.46	0	0
SE	.26	.53	0	0
SSE	.21	.54	0	0
S	.38	.81	5	5
SSW	.38	.81	9	6
SW	.23	.59	0	0
WSW	.21	.50	0	0
W	.19	.46	0	0
WNW	.24	.49	1	2
NW	.33	.62	30	46
NNW	.30	.58	1	2
N	.21	.54	0	0

TABLE E3-24

PEDESTRIAN LEVEL WIND TEST DATA

NO-BUILD

LOCATION 1

WIND	RATIOS		WEIGHT
ANGLE	MEAN	GUST	(ANNUAL)
NNE	.24	.56	0
NE	.28	.55	2
ENE	.27	.54	3
E	.24	.47	0
ESE	.26	.62	0
SE	.32	.72	0
SSE	.22	.55	0
S	.28	.56	0
SSW	.30	.59	0
SW	.19	.46	0
WSW	.25	.50	0
W	.24	.48	0
WNW	.36	.59	62
NW	.34	.63	32
NNW	.19	.46	0
N	.21	.51	0

LOCATION 2

WIND	RATIOS		WEIGHT
ANGLE	MEAN	GUST	(ANNUAL)
NNE	.32	.64	2
NE	.35	.63	16
ENE	.33	.56	12
E	.26	.51	1
ESE	.22	.47	0
SE	.23	.55	0
SSE	.22	.50	0
S	.24	.53	0
SSW	.34	.64	4
SW	.31	.68	5
WSW	.24	.49	0
W	.28	.61	5
WNW	.31	.54	35
NW	.30	.57	20
NNW	.22	.48	0
N	.28	.58	1

LOCATION 3

WIND	RATIOS		WEIGHT
ANGLE	MEAN	GUST	(ANNUAL)
NNE	.22	.52	0
NE	.25	.52	0
ENE	.22	.45	0
E	.20	.44	0
ESE	.29	.55	0
SE	.36	.76	0
SSE	.29	.64	0
S	.30	.61	0
SSW	.31	.61	0
SW	.27	.55	0
WSW	.20	.46	0
W	.36	.67	7
WNW	.45	.75	90
NW	.30	.64	3
NNW	.21	.53	0
N	.27	.56	0

BUILD

LOCATION 1

WIND	RATIOS		WEIGHT
ANGLE	MEAN	GUST	(ANNUAL)
NNE	.27	.60	2
NE	.28	.64	10
ENE	.26	.54	7
E	.17	.35	0
ESE	.22	.44	0
SE	.22	.45	0
SSE	.22	.44	0
S	.23	.47	0
SSW	.19	.44	0
SW	.17	.37	0
WSW	.23	.57	0
W	.20	.38	0
WNW	.31	.52	78
NW	.19	.41	1
NNW	.18	.40	0
N	.23	.50	1

LOCATION 2

WIND	RATIOS		WEIGHT
ANGLE	MEAN	GUST	(ANNUAL)
NNE	.20	.43	0
NE	.17	.39	0
ENE	.31	.60	12
E	.22	.43	0
ESE	.25	.52	0
SE	.28	.54	0
SSE	.24	.50	0
S	.28	.62	1
SSW	.32	.62	3
SW	.32	.58	13
WSW	.29	.57	4
W	.27	.52	5
WNW	.31	.53	52
NW	.25	.54	7
NNW	.26	.59	1
N	.25	.49	1

LOCATION 3

WIND	RATIOS		WEIGHT
ANGLE	MEAN	GUST	(ANNUAL)
NNE	.33	.75	8
NE	.24	.61	3
ENE	.21	.48	1
E	.16	.34	0
ESE	.15	.30	0
SE	.18	.41	0
SSE	.24	.57	0
S	.27	.63	1
SSW	.24	.56	0
SW	.20	.45	0
WSW	.18	.38	0
W	.18	.37	0
WNW	.30	.56	61
NW	.25	.46	13
NNW	.26	.58	2
N	.33	.71	11

TABLE E3-25

PEDESTRIAN LEVEL WIND TEST DATA

NO-BUILD

LOCATION 4

WIND ANGLE	RATIOS		WEIGHT (ANNUAL)
	MEAN	GUST	
NNE	.29	.62	6
NE	.26	.54	10
ENE	.23	.53	6
E	.22	.52	1
ESE	.29	.54	3
SE	.35	.65	3
SSE	.29	.60	1
S	.27	.55	3
SSW	.31	.59	9
SW	.18	.41	0
WSW	.22	.50	1
W	.21	.43	2
WNW	.20	.46	5
NW	.28	.58	45
NNW	.23	.51	1
N	.26	.61	4

LOCATION 5

WIND ANGLE	RATIOS		WEIGHT (ANNUAL)
	MEAN	GUST	
NNE	.19	.47	0
NE	.23	.51	0
ENE	.23	.51	0
E	.19	.42	0
ESE	.21	.46	0
SE	.27	.57	0
SSE	.24	.57	0
S	.23	.55	0
SSW	.24	.52	0
SW	.21	.48	0
WSW	.18	.41	0
W	.31	.62	1
WNW	.47	.80	96
NW	.32	.68	4
NNW	.22	.52	0
N	.27	.54	0

LOCATION 6

WIND ANGLE	RATIOS		WEIGHT (ANNUAL)
	MEAN	GUST	
NNE	.17	.42	0
NE	.20	.47	0
ENE	.19	.46	0
E	.18	.39	0
ESE	.19	.44	0
SE	.24	.55	0
SSE	.21	.49	0
S	.20	.48	0
SSW	.22	.53	0
SW	.18	.44	0
WSW	.16	.36	0
W	.23	.52	0
WNW	.42	.76	99
NW	.27	.62	2
NNW	.20	.53	0
N	.25	.56	0

BUILD

LOCATION 4

WIND ANGLE	RATIOS		WEIGHT (ANNUAL)
	MEAN	GUST	
NNE	.30	.69	14
NE	.26	.64	18
ENE	.22	.48	8
E	.16	.30	0
ESE	.16	.30	0
SE	.19	.42	0
SSE	.22	.52	0
S	.24	.52	2
SSW	.24	.47	2
SW	.27	.51	18
WSW	.23	.51	4
W	.21	.42	5
WNW	.19	.42	7
NW	.20	.47	9
NNW	.20	.44	1
N	.27	.60	10

LOCATION 5

WIND ANGLE	RATIOS		WEIGHT (ANNUAL)
	MEAN	GUST	
NNE	.16	.32	0
NE	.14	.27	0
ENE	.16	.34	2
E	.14	.27	0
ESE	.15	.28	0
SE	.17	.39	0
SSE	.20	.44	0
S	.21	.48	2
SSW	.21	.44	2
SW	.21	.46	10
WSW	.18	.43	2
W	.19	.44	9
WNW	.20	.41	41
NW	.20	.39	25
NNW	.19	.38	4
N	.18	.36	1

LOCATION 6

WIND ANGLE	RATIOS		WEIGHT (ANNUAL)
	MEAN	GUST	
NNE	.15	.33	1
NE	.15	.27	3
ENE	.17	.38	8
E	.15	.26	1
ESE	.15	.25	0
SE	.15	.26	0
SSE	.15	.28	0
S	.15	.31	0
SSW	.15	.29	0
SW	.17	.33	4
WSW	.17	.38	4
W	.18	.39	14
WNW	.18	.40	45
NW	.17	.36	18
NNW	.16	.31	2
N	.15	.26	1

TABLE E3-26

PEDESTRIAN LEVEL WIND TEST DATA

	NO-BUILD			BUILD		
	LOCATION 7			LOCATION 7		
WIND ANGLE	RATIOS MEAN	RATIOS GUST	WEIGHT (ANNUAL)	RATIOS MEAN	RATIOS GUST	WEIGHT (ANNUAL)
NNE	.19	.45	0	.14	.34	0
NE	.23	.53	4	.16	.36	0
ENE	.22	.50	3	.16	.35	0
E	.19	.41	0	.15	.32	0
ESE	.19	.41	0	.17	.38	0
SE	.25	.58	0	.29	.56	1
SSE	.19	.44	0	.29	.61	2
S	.25	.55	1	.38	.69	34
SSW	.30	.66	4	.39	.68	60
SW	.30	.61	16	.19	.48	0
WSW	.25	.56	3	.15	.35	0
W	.20	.45	1	.16	.38	0
WNW	.29	.59	67	.17	.39	2
NW	.18	.46	1	.15	.31	0
NNW	.17	.41	0	.18	.36	0
N	.22	.52	1	.13	.27	0

	LOCATION 8			LOCATION 8		
WIND ANGLE	RATIOS MEAN	RATIOS GUST	WEIGHT (ANNUAL)	RATIOS MEAN	RATIOS GUST	WEIGHT (ANNUAL)
NNE	.18	.44	1	.31	.63	8
NE	.23	.51	15	.38	.69	46
ENE	.21	.49	10	.22	.53	3
E	.19	.47	1	.17	.30	0
ESE	.21	.50	1	.21	.40	0
SE	.23	.60	0	.32	.56	1
SSE	.21	.48	0	.27	.53	0
S	.22	.48	3	.33	.55	8
SSW	.26	.55	11	.34	.57	14
SW	.19	.42	2	.27	.49	6
WSW	.16	.30	0	.19	.38	0
W	.17	.36	2	.19	.39	0
WNW	.21	.50	42	.19	.37	2
NW	.19	.40	12	.19	.34	1
NNW	.17	.35	0	.25	.45	2
N	.19	.44	1	.29	.50	7

	LOCATION 9			LOCATION 9		
WIND ANGLE	RATIOS MEAN	RATIOS GUST	WEIGHT (ANNUAL)	RATIOS MEAN	RATIOS GUST	WEIGHT (ANNUAL)
NNE	.25	.54	1	.22	.49	2
NE	.31	.62	17	.20	.42	3
ENE	.26	.56	7	.26	.49	17
E	.27	.53	3	.24	.47	4
ESE	.28	.55	1	.25	.48	2
SE	.34	.70	1	.30	.60	2
SSE	.19	.47	0	.22	.51	0
S	.26	.63	1	.31	.68	12
SSW	.31	.68	5	.32	.70	22
SW	.31	.63	15	.27	.64	22
WSW	.31	.59	13	.21	.50	1
W	.29	.53	19	.19	.44	2
WNW	.22	.46	6	.18	.38	4
NW	.24	.46	10	.19	.38	5
NNW	.16	.34	0	.18	.36	0
N	.19	.46	0	.16	.36	0

TABLE E3-27

PEDESTRIAN LEVEL WIND TEST DATA

NO-BUILD

LOCATION 10

WIND	RATIOS		WEIGHT
ANGLE	MEAN	GUST	(ANNUAL)
NNE	.19	.45	0
NE	.25	.54	8
ENE	.26	.54	11
E	.23	.47	1
ESE	.22	.47	0
SE	.29	.64	0
SSE	.17	.42	0
S	.20	.48	0
SSW	.27	.62	3
SW	.28	.59	12
WSW	.30	.58	19
W	.28	.53	26
WNW	.22	.46	13
NW	.21	.45	6
NNW	.16	.36	0
N	.21	.52	1

LOCATION 11

WIND	RATIOS		WEIGHT
ANGLE	MEAN	GUST	(ANNUAL)
NNE	.20	.46	0
NE	.32	.67	16
ENE	.31	.62	14
E	.23	.47	0
ESE	.23	.44	0
SE	.20	.45	0
SSE	.16	.37	0
S	.16	.36	0
SSW	.16	.33	0
SW	.18	.39	0
WSW	.18	.44	0
W	.20	.48	0
WNW	.25	.52	13
NW	.32	.65	53
NNW	.28	.61	3
N	.18	.45	0

LOCATION 12

WIND	RATIOS		WEIGHT
ANGLE	MEAN	GUST	(ANNUAL)
NNE	.19	.47	0
NE	.29	.63	8
ENE	.33	.65	18
E	.28	.50	2
ESE	.28	.48	1
SE	.24	.45	0
SSE	.24	.46	0
S	.17	.35	0
SSW	.18	.42	0
SW	.21	.46	0
WSW	.20	.48	0
W	.22	.54	1
WNW	.27	.56	18
NW	.33	.64	49
NNW	.30	.64	5
N	.18	.41	0

BUILD

LOCATION 10

WIND	RATIOS		WEIGHT
ANGLE	MEAN	GUST	(ANNUAL)
NNE	.16	.45	0
NE	.16	.40	0
ENE	.25	.48	8
E	.24	.49	2
ESE	.26	.53	1
SE	.36	.68	3
SSE	.27	.60	1
S	.36	.76	17
SSW	.38	.71	39
SW	.20	.54	0
WSW	.16	.41	0
W	.18	.42	0
WNW	.22	.43	10
NW	.23	.39	13
NNW	.26	.46	5
N	.15	.41	0

LOCATION 11

WIND	RATIOS		WEIGHT
ANGLE	MEAN	GUST	(ANNUAL)
NNE	.22	.48	0
NE	.25	.55	3
ENE	.24	.56	2
E	.18	.43	0
ESE	.19	.42	0
SE	.26	.52	0
SSE	.18	.46	0
S	.23	.62	0
SSW	.24	.59	0
SW	.17	.41	0
WSW	.18	.44	0
W	.18	.41	0
WNW	.23	.50	4
NW	.35	.68	60
NNW	.37	.71	32
N	.22	.50	0

LOCATION 12

WIND	RATIOS		WEIGHT
ANGLE	MEAN	GUST	(ANNUAL)
NNE	.23	.53	0
NE	.32	.60	10
ENE	.30	.63	7
E	.25	.48	0
ESE	.26	.48	0
SE	.30	.51	0
SSE	.31	.58	0
S	.24	.53	0
SSW	.22	.52	0
SW	.18	.41	0
WSW	.21	.51	0
W	.20	.48	0
WNW	.26	.57	9
NW	.35	.66	50
NNW	.37	.70	24
N	.23	.53	0

TABLE E3-28

PEDESTRIAN LEVEL WIND TEST DATA

NO-BUILD

LOCATION 13

WIND	RATIOS		WEIGHT
ANGLE	MEAN	GUST	(ANNUAL)
NNE	.25	.51	2
NE	.31	.63	23
ENE	.22	.48	3
E	.21	.47	0
ESE	.25	.57	1
SE	.24	.60	0
SSE	.19	.46	0
S	.25	.56	1
SSW	.26	.67	1
SW	.28	.65	11
WSW	.28	.61	8
W	.27	.50	20
WNW	.24	.47	20
NW	.22	.44	8
NNW	.14	.30	0
N	.16	.40	0

LOCATION 14

WIND	RATIOS		WEIGHT
ANGLE	MEAN	GUST	(ANNUAL)
NNE	.21	.48	0
NE	.25	.55	8
ENE	.28	.55	16
E	.25	.51	2
ESE	.23	.47	0
SE	.30	.74	1
SSE	.22	.54	0
S	.19	.46	0
SSW	.21	.49	0
SW	.24	.53	3
WSW	.27	.56	9
W	.27	.53	22
WNW	.25	.53	34
NW	.21	.44	4
NNW	.17	.40	0
N	.20	.44	0

LOCATION 15

WIND	RATIOS		WEIGHT
ANGLE	MEAN	GUST	(ANNUAL)
NNE	.19	.52	1
NE	.31	.66	52
ENE	.20	.56	8
E	.16	.37	0
ESE	.15	.37	0
SE	.15	.36	0
SSE	.14	.31	0
S	.14	.30	0
SSW	.21	.50	1
SW	.20	.47	3
WSW	.15	.37	0
W	.16	.39	1
WNW	.16	.41	3
NW	.21	.52	26
NNW	.20	.49	2
N	.16	.38	0

BUILD

LOCATION 13

WIND	RATIOS		WEIGHT
ANGLE	MEAN	GUST	(ANNUAL)
NNE	.15	.32	0
NE	.20	.42	2
ENE	.24	.48	8
E	.23	.43	2
ESE	.24	.47	1
SE	.30	.59	1
SSE	.21	.56	0
S	.24	.59	1
SSW	.29	.69	8
SW	.32	.73	40
WSW	.19	.50	0
W	.20	.47	2
WNW	.19	.41	4
NW	.25	.46	28
NNW	.22	.41	1
N	.14	.26	0

LOCATION 14

WIND	RATIOS		WEIGHT
ANGLE	MEAN	GUST	(ANNUAL)
NNE	.15	.33	0
NE	.19	.42	1
ENE	.29	.52	20
E	.26	.52	4
ESE	.25	.51	1
SE	.32	.69	2
SSE	.22	.55	0
S	.25	.59	1
SSW	.26	.63	2
SW	.23	.54	2
WSW	.21	.48	1
W	.18	.41	0
WNW	.19	.41	3
NW	.27	.50	44
NNW	.28	.52	17
N	.14	.27	0

LOCATION 15

WIND	RATIOS		WEIGHT
ANGLE	MEAN	GUST	(ANNUAL)
NNE	.16	.43	0
NE	.25	.66	17
ENE	.15	.41	1
E	.16	.37	0
ESE	.16	.38	0
SE	.17	.39	0
SSE	.15	.34	0
S	.18	.50	0
SSW	.20	.52	1
SW	.15	.34	0
WSW	.15	.34	0
W	.14	.37	0
WNW	.15	.42	1
NW	.21	.53	16
NNW	.30	.65	60
N	.22	.53	3

TABLE E3-29

PEDESTRIAN LEVEL WIND TEST DATA

NO-BUILD

LOCATION 16

WIND	RATIOS		WEIGHT
ANGLE	MEAN	GUST	(ANNUAL)
NNE	.22	.50	0
NE	.33	.65	20
ENE	.30	.61	13
E	.27	.51	2
ESE	.25	.50	0
SE	.31	.72	0
SSE	.32	.67	1
S	.18	.44	0
SSW	.26	.54	0
SW	.24	.50	1
WSW	.29	.55	5
W	.29	.54	17
WNW	.28	.53	35
NW	.22	.46	3
NNW	.25	.57	1
N	.21	.48	0

LOCATION 17

WIND	RATIOS		WEIGHT
ANGLE	MEAN	GUST	(ANNUAL)
NNE	.34	.77	6
NE	.47	.84	60
ENE	.32	.62	14
E	.24	.52	0
ESE	.23	.46	0
SE	.28	.66	0
SSE	.17	.46	0
S	.14	.33	0
SSW	.25	.50	0
SW	.26	.54	1
WSW	.23	.50	0
W	.24	.53	1
WNW	.26	.51	11
NW	.24	.54	4
NNW	.20	.50	0
N	.23	.55	0

LOCATION 18

WIND	RATIOS		WEIGHT
ANGLE	MEAN	GUST	(ANNUAL)
NNE	.24	.54	1
NE	.32	.66	21
ENE	.27	.55	10
E	.24	.50	1
ESE	.24	.49	0
SE	.27	.60	0
SSE	.34	.73	2
S	.19	.43	0
SSW	.26	.54	1
SW	.25	.51	2
WSW	.28	.53	6
W	.27	.52	14
WNW	.27	.55	37
NW	.20	.41	2
NNW	.23	.53	1
N	.18	.42	0

BUILD

LOCATION 16

WIND	RATIOS		WEIGHT
ANGLE	MEAN	GUST	(ANNUAL)
NNE	.24	.47	1
NE	.30	.56	17
ENE	.36	.56	35
E	.31	.57	8
ESE	.27	.52	1
SE	.32	.61	1
SSE	.22	.53	0
S	.23	.57	0
SSW	.22	.51	0
SW	.25	.55	2
WSW	.29	.59	9
W	.26	.50	10
WNW	.23	.44	12
NW	.20	.43	2
NNW	.22	.44	0
N	.19	.34	0

LOCATION 17

WIND	RATIOS		WEIGHT
ANGLE	MEAN	GUST	(ANNUAL)
NNE	.41	.71	8
NE	.41	.80	22
ENE	.39	.69	17
E	.26	.51	0
ESE	.22	.43	0
SE	.27	.54	0
SSE	.21	.56	0
S	.42	.78	7
SSW	.44	.83	14
SW	.30	.65	1
WSW	.27	.59	0
W	.23	.45	0
WNW	.27	.47	4
NW	.33	.59	19
NNW	.28	.50	0
N	.38	.64	6

LOCATION 18

WIND	RATIOS		WEIGHT
ANGLE	MEAN	GUST	(ANNUAL)
NNE	.14	.25	1
NE	.15	.35	10
ENE	.15	.29	9
E	.14	.28	2
ESE	.14	.25	1
SE	.15	.31	0
SSE	.16	.37	1
S	.18	.42	7
SSW	.18	.40	11
SW	.16	.35	11
WSW	.14	.29	3
W	.14	.23	6
WNW	.14	.22	20
NW	.14	.24	15
NNW	.14	.27	3
N	.14	.25	2

TABLE E3-30

PEDESTRIAN LEVEL WIND TEST DATA

NO-BUILD

LOCATION 19

WIND	RATIOS		WEIGHT
ANGLE	MEAN	GUST	(ANNUAL)
NNE	.21	.55	0
NE	.42	.80	55
ENE	.32	.67	19
E	.23	.52	1
ESE	.21	.47	0
SE	.28	.62	0
SSE	.31	.66	1
S	.18	.44	0
SSW	.25	.53	0
SW	.24	.51	1
WSW	.26	.52	2
W	.27	.53	11
WNW	.23	.48	8
NW	.19	.42	1
NNW	.19	.44	0
N	.17	.43	0

LOCATION 20

WIND	RATIOS		WEIGHT
ANGLE	MEAN	GUST	(ANNUAL)
NNE	.21	.51	0
NE	.39	.72	54
ENE	.30	.62	20
E	.22	.49	1
ESE	.21	.44	0
SE	.28	.61	0
SSE	.31	.66	1
S	.20	.45	0
SSW	.23	.49	0
SW	.21	.48	0
WSW	.23	.49	2
W	.25	.51	10
WNW	.22	.46	8
NW	.18	.42	1
NNW	.21	.50	0
N	.19	.49	0

LOCATION 21

WIND	RATIOS		WEIGHT
ANGLE	MEAN	GUST	(ANNUAL)
NNE	.25	.56	0
NE	.24	.58	1
ENE	.19	.54	0
E	.29	.74	2
ESE	.39	.87	5
SE	.48	.87	6
SSE	.29	.61	0
S	.13	.28	0
SSW	.14	.30	0
SW	.15	.36	0
WSW	.15	.33	0
W	.19	.43	0
WNW	.32	.56	43
NW	.32	.64	31
NNW	.32	.69	6
N	.34	.70	6

BUILD

LOCATION 19

WIND	RATIOS		WEIGHT
ANGLE	MEAN	GUST	(ANNUAL)
NNE	.22	.46	0
NE	.27	.54	6
ENE	.35	.56	26
E	.33	.63	7
ESE	.21	.50	0
SE	.24	.50	0
SSE	.20	.54	0
S	.29	.69	2
SSW	.38	.74	18
SW	.31	.69	10
WSW	.34	.65	19
W	.27	.50	9
WNW	.21	.39	2
NW	.21	.43	1
NNW	.20	.43	0
N	.17	.38	0

LOCATION 20

WIND	RATIOS		WEIGHT
ANGLE	MEAN	GUST	(ANNUAL)
NNE	.19	.42	0
NE	.27	.59	17
ENE	.30	.59	27
E	.25	.60	4
ESE	.19	.38	0
SE	.24	.52	0
SSE	.19	.43	0
S	.27	.58	3
SSW	.34	.65	24
SW	.26	.57	11
WSW	.26	.53	10
W	.19	.39	1
WNW	.16	.32	0
NW	.17	.37	1
NNW	.17	.36	0
N	.15	.35	0

LOCATION 21

WIND	RATIOS		WEIGHT
ANGLE	MEAN	GUST	(ANNUAL)
NNE	.23	.56	2
NE	.21	.53	4
ENE	.20	.49	3
E	.29	.62	11
ESE	.35	.73	15
SE	.48	.81	27
SSE	.29	.64	1
S	.15	.37	0
SSW	.20	.48	0
SW	.19	.44	0
WSW	.17	.37	0
W	.17	.36	0
WNW	.21	.44	12
NW	.23	.54	19
NNW	.16	.43	0
N	.25	.57	5

TABLE E3-31

PEDESTRIAN LEVEL WIND TEST DATA

NO-BUILD

LOCATION 22

WIND	RATIOS		WEIGHT
ANGLE	MEAN	GUST	(ANNUAL)
NNE	.21	.49	1
NE	.31	.61	30
ENE	.22	.50	6
E	.21	.46	1
ESE	.23	.50	1
SE	.19	.49	0
SSE	.18	.48	0
S	.18	.42	0
SSW	.17	.37	0
SW	.22	.52	2
WSW	.25	.53	7
W	.24	.50	13
WNW	.20	.45	9
NW	.23	.48	20
NNW	.26	.55	9
N	.22	.54	1

LOCATION 23

WIND	RATIOS		WEIGHT
ANGLE	MEAN	GUST	(ANNUAL)
NNE	.24	.49	2
NE	.24	.49	10
ENE	.22	.50	5
E	.20	.50	1
ESE	.25	.57	2
SE	.31	.58	2
SSE	.30	.63	2
S	.24	.55	1
SSW	.18	.47	0
SW	.17	.43	0
WSW	.25	.56	6
W	.19	.43	1
WNW	.22	.51	22
NW	.24	.51	24
NNW	.24	.55	6
N	.30	.55	16

LOCATION 24

WIND	RATIOS		WEIGHT
ANGLE	MEAN	GUST	(ANNUAL)
NNE	.19	.40	0
NE	.32	.53	12
ENE	.24	.42	2
E	.20	.40	0
ESE	.27	.51	0
SE	.28	.53	0
SSE	.34	.68	1
S	.27	.56	0
SSW	.26	.57	0
SW	.41	.76	49
WSW	.35	.67	16
W	.31	.61	15
WNW	.23	.49	2
NW	.22	.42	2
NNW	.22	.42	0
N	.19	.41	0

BUILD

LOCATION 22

WIND	RATIOS		WEIGHT
ANGLE	MEAN	GUST	(ANNUAL)
NNE	.22	.51	0
NE	.21	.47	2
ENE	.27	.48	12
E	.21	.43	1
ESE	.22	.45	0
SE	.19	.45	0
SSE	.19	.49	0
S	.18	.43	0
SSW	.35	.72	20
SW	.33	.69	38
WSW	.30	.65	18
W	.22	.46	3
WNW	.18	.36	1
NW	.19	.38	2
NNW	.19	.42	0
N	.23	.55	2

LOCATION 23

WIND	RATIOS		WEIGHT
ANGLE	MEAN	GUST	(ANNUAL)
NNE	.18	.46	0
NE	.17	.38	1
ENE	.18	.42	2
E	.16	.41	0
ESE	.23	.56	2
SE	.26	.58	1
SSE	.34	.64	5
S	.21	.54	1
SSW	.18	.44	0
SW	.17	.42	0
WSW	.20	.47	1
W	.17	.40	1
WNW	.18	.42	7
NW	.23	.56	35
NNW	.24	.56	9
N	.33	.62	34

LOCATION 24

WIND	RATIOS		WEIGHT
ANGLE	MEAN	GUST	(ANNUAL)
NNE	.20	.41	0
NE	.22	.42	5
ENE	.22	.41	6
E	.15	.33	0
ESE	.18	.42	0
SE	.21	.47	0
SSE	.28	.56	1
S	.30	.66	8
SSW	.40	.76	61
SW	.27	.71	15
WSW	.19	.46	0
W	.16	.34	0
WNW	.15	.32	0
NW	.19	.36	3
NNW	.16	.32	0
N	.17	.34	0

TABLE E3-32

PEDESTRIAN LEVEL WIND TEST DATA

	NO-BUILD			BUILD		
	LOCATION 25			LOCATION 25		
WIND	RATIOS		WEIGHT	RATIOS		WEIGHT
ANGLE	MEAN	GUST	(ANNUAL)	MEAN	GUST	(ANNUAL)
NNE	.21	.58	1	.29	.62	2
NE	.19	.52	2	.51	.81	79
ENE	.16	.35	0	.30	.59	10
E	.14	.30	0	.31	.57	4
ESE	.14	.31	0	.20	.45	0
SE	.15	.45	0	.27	.56	0
SSE	.18	.48	0	.28	.60	0
S	.15	.37	0	.20	.40	0
SSW	.19	.43	0	.28	.51	1
SW	.22	.50	2	.20	.45	0
WSW	.21	.47	1	.15	.29	0
W	.21	.49	3	.14	.24	0
WNW	.23	.54	29	.14	.27	0
NW	.23	.57	19	.15	.29	0
NNW	.30	.62	31	.22	.53	0
N	.29	.68	13	.29	.63	3

	NO-BUILD			BUILD		
	LOCATION 26			LOCATION 26		
WIND	RATIOS		WEIGHT	RATIOS		WEIGHT
ANGLE	MEAN	GUST	(ANNUAL)	MEAN	GUST	(ANNUAL)
NNE	.27	.70	1	.21	.53	3
NE	.33	.71	19	.18	.45	4
ENE	.29	.66	11	.17	.48	3
E	.22	.51	0	.18	.46	1
ESE	.20	.43	0	.19	.49	0
SE	.15	.36	0	.29	.58	3
SSE	.16	.37	0	.31	.63	5
S	.14	.33	0	.15	.34	0
SSW	.26	.51	0	.20	.39	1
SW	.35	.65	30	.15	.33	0
WSW	.35	.61	25	.14	.24	0
W	.29	.59	13	.14	.26	0
WNW	.19	.46	0	.16	.38	5
NW	.18	.46	0	.22	.48	38
NNW	.18	.45	0	.24	.58	16
N	.22	.57	0	.28	.63	22

	NO-BUILD			BUILD		
	LOCATION 27			LOCATION 27		
WIND	RATIOS		WEIGHT	RATIOS		WEIGHT
ANGLE	MEAN	GUST	(ANNUAL)	MEAN	GUST	(ANNUAL)
NNE	.24	.58	0	.29	.64	1
NE	.24	.54	3	.22	.52	1
ENE	.21	.50	1	.17	.35	0
E	.21	.50	0	.19	.42	0
ESE	.24	.52	0	.19	.46	0
SE	.29	.60	0	.21	.44	0
SSE	.24	.52	0	.29	.61	0
S	.23	.53	0	.26	.54	0
SSW	.20	.55	0	.23	.49	0
SW	.28	.64	6	.21	.51	0
WSW	.21	.48	0	.17	.32	0
W	.23	.48	1	.17	.34	0
WNW	.26	.59	19	.20	.42	0
NW	.28	.60	24	.32	.58	33
NNW	.37	.68	41	.43	.71	63
N	.29	.66	4	.28	.61	2

TABLE E3-33

PEDESTRIAN LEVEL WIND TEST DATA

NO-BUILD

LOCATION 28

WIND	RATIOS		WEIGHT
ANGLE	MEAN	GUST	(ANNUAL)
NNE	.34	.70	13
NE	.33	.66	27
ENE	.30	.61	18
E	.22	.49	1
ESE	.23	.51	0
SE	.25	.59	0
SSE	.23	.52	0
S	.18	.45	0
SSW	.29	.59	4
SW	.30	.56	17
WSW	.28	.52	9
W	.23	.46	3
WNW	.18	.45	1
NW	.19	.45	2
NNW	.25	.52	2
N	.25	.60	2

LOCATION 29

WIND	RATIOS		WEIGHT
ANGLE	MEAN	GUST	(ANNUAL)
NNE	.19	.48	1
NE	.27	.61	26
ENE	.26	.60	24
E	.27	.72	13
ESE	.30	.70	10
SE	.20	.55	0
SSE	.21	.56	0
S	.19	.48	0
SSW	.24	.65	4
SW	.24	.59	13
WSW	.18	.46	1
W	.17	.37	1
WNW	.16	.40	2
NW	.18	.46	5
NNW	.14	.31	0
N	.14	.31	0

LOCATION 30

WIND	RATIOS		WEIGHT
ANGLE	MEAN	GUST	(ANNUAL)
NNE	.14	.34	0
NE	.17	.40	5
ENE	.17	.46	5
E	.17	.43	2
ESE	.25	.60	9
SE	.20	.56	0
SSE	.28	.73	5
S	.18	.49	1
SSW	.20	.51	3
SW	.19	.47	6
WSW	.15	.40	0
W	.19	.51	18
WNW	.17	.43	27
NW	.17	.47	15
NNW	.15	.37	0
N	.13	.31	0

BUILD

LOCATION 28

WIND	RATIOS		WEIGHT
ANGLE	MEAN	GUST	(ANNUAL)
NNE	.24	.59	1
NE	.20	.46	1
ENE	.20	.50	2
E	.28	.64	6
ESE	.33	.74	7
SE	.24	.56	0
SSE	.24	.51	0
S	.20	.42	0
SSW	.15	.25	0
SW	.15	.26	0
WSW	.15	.26	0
W	.17	.35	0
WNW	.19	.41	3
NW	.29	.61	52
NNW	.30	.66	17
N	.31	.68	12

LOCATION 29

WIND	RATIOS		WEIGHT
ANGLE	MEAN	GUST	(ANNUAL)
NNE	.20	.47	0
NE	.33	.63	22
ENE	.22	.52	2
E	.31	.55	7
ESE	.30	.54	2
SE	.21	.47	0
SSE	.21	.40	0
S	.15	.30	0
SSW	.13	.24	0
SW	.14	.30	0
WSW	.18	.47	0
W	.24	.51	4
WNW	.29	.54	54
NW	.23	.50	7
NNW	.25	.57	2
N	.23	.53	0

LOCATION 30

WIND	RATIOS		WEIGHT
ANGLE	MEAN	GUST	(ANNUAL)
NNE	.30	.65	2
NE	.45	.75	55
ENE	.31	.60	11
E	.23	.43	0
ESE	.18	.37	0
SE	.15	.28	0
SSE	.18	.35	0
S	.16	.31	0
SSW	.16	.32	0
SW	.23	.45	0
WSW	.28	.53	2
W	.29	.52	11
WNW	.26	.51	15
NW	.22	.41	1
NNW	.19	.43	0
N	.23	.62	0

TABLE E3-34

PEDESTRIAN LEVEL WIND TEST DATA

NO-BUILD

LOCATION 31

WIND	RATIOS		WEIGHT
ANGLE	MEAN	GUST	(ANNUAL)
NNE	.17	.40	0
NE	.16	.34	1
ENE	.18	.41	2
E	.16	.40	0
ESE	.17	.42	0
SE	.16	.44	0
SSE	.18	.47	0
S	.15	.38	0
SSW	.20	.52	0
SW	.22	.54	4
WSW	.20	.49	1
W	.19	.43	3
WNW	.25	.52	66
NW	.19	.44	8
NNW	.26	.53	16
N	.16	.37	0

LOCATION 32

WIND	RATIOS		WEIGHT
ANGLE	MEAN	GUST	(ANNUAL)
NNE	.21	.49	1
NE	.25	.57	15
ENE	.26	.56	19
E	.27	.64	8
ESE	.27	.61	3
SE	.22	.55	0
SSE	.20	.51	0
S	.13	.29	0
SSW	.15	.33	0
SW	.16	.36	0
WSW	.15	.34	0
W	.13	.29	0
WNW	.14	.40	0
NW	.21	.54	13
NNW	.30	.64	40
N	.18	.48	0

LOCATION 0

WIND	RATIOS		WEIGHT
ANGLE	MEAN	GUST	(ANNUAL)
NNE	.00	.00	0
NE	.00	.00	0
ENE	.00	.00	0
E	.00	.00	0
ESE	.00	.00	0
SE	.00	.00	0
SSE	.00	.00	0
S	.00	.00	0
SSW	.00	.00	0
SW	.00	.00	0
WSW	.00	.00	0
W	.00	.00	0
WNW	.00	.00	0
NW	.00	.00	0
NNW	.00	.00	0
N	.00	.00	0

BUILD

LOCATION 31

WIND	RATIOS		WEIGHT
ANGLE	MEAN	GUST	(ANNUAL)
NNE	.20	.52	4
NE	.19	.51	11
ENE	.15	.38	3
E	.14	.31	0
ESE	.14	.28	0
SE	.13	.24	0
SSE	.13	.23	0
S	.13	.22	0
SSW	.13	.23	0
SW	.14	.29	0
WSW	.16	.34	1
W	.16	.38	5
WNW	.19	.41	45
NW	.17	.41	19
NNW	.19	.45	6
N	.19	.46	5

LOCATION 32

WIND	RATIOS		WEIGHT
ANGLE	MEAN	GUST	(ANNUAL)
NNE	.18	.40	1
NE	.22	.57	13
ENE	.22	.58	14
E	.20	.43	2
ESE	.20	.51	1
SE	.20	.44	0
SSE	.22	.48	1
S	.16	.33	0
SSW	.21	.46	2
SW	.21	.44	6
WSW	.20	.42	4
W	.17	.35	2
WNW	.16	.36	4
NW	.21	.51	30
NNW	.24	.56	18
N	.20	.47	2

LOCATION 33

WIND	RATIOS		WEIGHT
ANGLE	MEAN	GUST	(ANNUAL)
NNE	.23	.50	0
NE	.33	.61	8
ENE	.37	.67	16
E	.27	.52	0
ESE	.27	.53	0
SE	.37	.75	0
SSE	.27	.68	0
S	.37	.88	4
SSW	.35	.79	3
SW	.24	.60	0
WSW	.24	.54	0
W	.25	.51	0
WNW	.29	.54	16
NW	.37	.63	47
NNW	.33	.59	4
N	.19	.41	0

TABLE E3-35

PEDESTRIAN LEVEL WIND TEST DATA

NO-BUILD

LOCATION 0

WIND ANGLE	RATIOS MEAN	GUST	WEIGHT (ANNUAL)
NNE	.00	.00	0
NE	.00	.00	0
ENE	.00	.00	0
E	.00	.00	0
ESE	.00	.00	0
SE	.00	.00	0
SSE	.00	.00	0
S	.00	.00	0
SSW	.00	.00	0
SW	.00	.00	0
WSW	.00	.00	0
W	.00	.00	0
WNW	.00	.00	0
NW	.00	.00	0
NNW	.00	.00	0
N	.00	.00	0

BUILD

LOCATION 34

WIND ANGLE	RATIOS MEAN	GUST	WEIGHT (ANNUAL)
NNE	.30	.70	1
NE	.37	.76	20
ENE	.38	.74	24
E	.27	.52	1
ESE	.23	.46	0
SE	.26	.53	0
SSE	.21	.54	0
S	.38	.81	6
SSW	.38	.81	9
SW	.23	.59	0
WSW	.21	.50	0
W	.19	.46	0
WNW	.24	.49	3
NW	.33	.62	34
NNW	.30	.58	2
N	.21	.54	0

TABLE E3-36

PEDESTRIAN LEVEL WIND TEST DATA

Appendix F Boston Redevelopment Authority Approvals

MEMORANDUM JUNE 24, 1993

TO: BOSTON REDEVELOPMENT AUTHORITY AND
PAUL L. BARRETT, DIRECTOR

FROM: BEVERLEY E. JOHNSON, ASSISTANT DIRECTOR FOR
INSTITUTIONAL PLANNING AND DEVELOPMENT
E. OWEN DONNELLY, DEPUTY DIRECTOR
LAWRENCE BROPHY, SENIOR PLANNER

SUBJECT: PUBLIC HEARING CONCERNING A DEVELOPMENT IMPACT PROJECT PLAN AND A PLANNED DEVELOPMENT AREA DEVELOPMENT PLAN SUBMITTED BY BOSTON UNIVERSITY IN CONNECTION WITH THE PROPOSED SCHOOL OF MANAGEMENT PROJECT

SUMMARY: This project was taken under advisement by the Board at the June 10, 1993 meeting. This memorandum requests that the Authority: (1) Approve the Development Plan and Development Impact Project Plan submitted by Boston University in connection with the proposed School of Management Project ("the Development Plan"); (2) Authorize the Director to enter into a Development Impact Project Agreement and a Cooperation Agreement with Boston University; (3) Authorize the Director to petition the Zoning Commission for the designation of the Planned Development Area; (4) Authorize the Director to recommend approval, conditional upon design review, of the petition to the Board of Appeal for zoning relief in connection with the Proposed Project; (5) Authorize the Director to issue an Adequacy Determination upon completion of the Authority's Article 31 Development Review Process; (6) Approve the Schematic Design; and (7) Authorize the Director to take all actions and execute all documents deemed necessary and appropriate relative to the Development Plan.

INTRODUCTION

On June 10, 1993, the Boston Redevelopment Authority held a public hearing concerning the Development Plan and the Development Impact Project Plan submitted by Boston University in connection with the proposed School of Management Project. At the conclusion of the hearing, the Authority voted to take the project under advisement so that issues raised could be addressed. On June 21, 1993, the Director met with representatives of area residents to discuss their concerns. Sufficient agreement was reached at the meeting to confirm that the outstanding issues can be resolved as a part of the completion of the Authority's Article 31 process.

Boston University proposes to construct a School of Management and an executive administration center on their Charles River campus at 595 Commonwealth Avenue. The proponent requests approval of a Development Impact Project Plan and a Planned Development Area Development Plan. Boston University has voluntarily agreed to have the project undergo a review process pursuant to Article 31 of the Boston Zoning Code. The Proposed Project (the "Proposed Project") was programmed in the Boston University Master Plan 1986-1996 which was approved by the Boston Redevelopment Authority on March 26, 1987.

PROJECT DESCRIPTION

Boston University proposes to construct a $70 million new School of Management and administration center at 595 Commonwealth Avenue. The Proposed Project will be privately financed. The building will contain approximately 321,700 square feet of gross floor area devoted to academic and administrative uses and 270 parking spaces on three levels below grade. The new facilities will accommodate the School's enrollment of approximately 3,400 graduate and undergraduate students and 112 full-time and 81 part-time faculty. The need for the new building is not only created by expanded programs over the years but also by the changes in teaching techniques and technology. The building will contain specialized classrooms, small case-study rooms, extensive computer facilities, a library, an auditorium, offices and support facilities. The structure will contain 9 stories and have a floor-area-ratio (FAR) of 6.5. The public sidewalks adjacent to the site will be landscaped.

The Project is located on the Boston University campus at the corner of Commonwealth Avenue and Sherborne Street near Kenmore Square. The site is approximately 49,686 square feet or 1.14 acres in size. Currently the parcel is used as a parking lot with a capacity of 181 cars and is located in a B-4 zone. The site is bounded by a Howard Johnson Motor Lodge (owned by Boston University) to the east, a University residence hall to the north, Commonwealth Avenue to the south, and Sherborne Street to the west. The buildings in the area contain a mix of commercial, academic, and residential uses. The more prominent buildings in the area have a FAR range of 5.5 to 8. The site is adjacent to the Bay State Road-Back Bay West Historic District to the north. The majority of buildings along this section of Bay State Road are owned by Boston University.

BOSTON UNIVERSITY MASTER PLAN

In 1987, Boston University completed a Master Plan for its Charles River campus through 18 months of cooperative effort with community residents, area merchants, University officials and representatives of the City of Boston and the Boston Redevelopment Authority. In order to facilitate the participation of the community interests in the planning process, a University Task Force was organized to function as the mechanism for facilitating the review process. The Boston Redevelopment Authority approved the Master Plan on March 26, 1987. Among other provisions, the Plan identifies a number of major parcels on campus that the University envisions as potential development sites within a ten year timeframe. In the Plan each site was analyzed and appropriate uses were proposed. The Proposed Project is located on a portion of Site Q. The Master Plan calls for the development of the School of Management on Site Q, along with other contemplated uses including expanded hotel facilities, a conference center, office, retail and other uses.

PROJECT REVIEW

Boston University has voluntarily agreed to comply with the Development Review Requirements set forth in Article 31 of the Boston Zoning Code. Accordingly, Boston University submitted a Project Notification Form to the BRA on August 25, 1992 and a Draft Project Impact Report on February 22, 1993. The University is currently preparing a Final Project Impact Report.

Community review of the Proposed Project has taken place within the context of the Article 31 process. Meetings have also been held with the Boston University Task Force which was established during the master planning process. In response to concerns raised by the community, Boston University has reduced the height of the project. The University Task Force has voted to support the project.

On March 19, 1993, the Executive Office of Environmental Affairs issued a determination that the Proposed Project would require the preparation of an Environmental Impact Report by Boston University. This report is currently being prepared.

BOSTON CIVIC DESIGN COMMISSION REVIEW

The Proposed Project was initially presented for review to the Boston Civic Design Commission (BCDC) on May 5, 1992. At that time, the Project was referred to the Subcommittee on Design of the BCDC. Several working meetings were held between the Subcommittee and the project proponent. Issues related to density and massing were not resolved to the satisfaction of both parties. On March 3, 1993 the BCDC voted to recommend disapproval of the project. The BCDC vote included a recommendation that the overall height of the building be reduced by at least two floors and that the massing also be reduced. Subsequently, Boston University reduced the project size from 366,000 GSF to 321,700 GSF (11%), reduced the project height the equivalent of two floors and reduced the FAR from 7.7 to 6.5 (15%).

TRANSPORTATION ACCESS PLAN AGREEMENT

The Proposed Project has been reviewed by the Boston Transportation Department. A Transportation Access Plan Agreement has been prepared and includes mitigation measures and provisions for the Proposed Project. A TAP Agreement satisfactory to the Commissioner of BTD will be executed prior to the issuance of a building permit for the construction of the Proposed Project.

THE GENERAL PLAN FOR THE CITY AS A WHOLE

In approving a development plan or a development impact project plan, the Authority must find that such plan conforms to the general plan for the City, as a whole.

By turning an underutilized site into a School of Management and Administration Center, the project will convert the site into a physical and financial asset and will improve land values and provide economic stimulus. By using materials and designs which are harmonious with the surrounding neighborhood, the Project will strengthen the neighborhood without compromising the historic and architectural integrity of the area. The project is consistent with the official general plan of the City as a whole as well as the "Boston University Charles River Campus Master Plan - 1986-1996."

With respect to this project, it has also been determined that nothing in the Development Plan will be injurious to the neighborhood or otherwise detrimental to the public welfare. Instead, the project will provide numerous positive impacts. Set forth below are some of the benefits which the public will receive as a result of the Proposed Project.

PUBLIC BENEFITS

The Proposed Project is a "Development Impact Project" (DIP) under Articles 26A and 26B of the Boston Zoning Code and therefore subject to housing and job linkage obligations. The DIP Agreement anticipates that approximately $1,108,500 in housing linkage funds and approximately $221,700 in job linkage funds will be generated by the Project.

The project cost is estimated to be $70 million and will generate approximately 300 construction jobs over a three year period. From a financial and economic perspective, the project is expected to contribute significantly to Boston's economy. It is anticipated that approximately 480 people will be employed at the site when the project is completed. With approximately 9,600 employees, the University is among the largest private employers in Boston.

Additionally, the project is expected to result in positive benefits to the City and to several neighborhoods which are adjacent to or near the University. These public benefits are expected to include (1) added vitality and safety along sections of

Commonwealth Avenue and Sherborne Street bordering the site; (2) the satisfaction of urban design objectives by filling the visual gap presented by the existing uses of the site; (3) the creation of a visual gateway at the eastern end of the University's Commonwealth Avenue campus; (4) pedestrian improvements with new landscaped areas and streetscaping elements; (5) improved pedestrian and traffic safety along Commonwealth Avenue; (6) the expansion of markets for Kenmore Square area businesses due to an influx of students and University employees; and (7) providing that abutting landowners approve, the paving of the alley to the rear of the site, leading to improved access and safety.

Boston University makes direct payments to the City of Boston in the form of taxes, in-lieu-of-tax payments, fees, and permits. In 1991, the University paid the City of Boston a total of $2.2 million. This reflects $1.6 million in real estate taxes, $300,000 in-lieu-of-tax payments, and $300,000 in fees and permits. Under a 1980 agreement with the City of Boston, Boston University pays real estate taxes on taxable properties acquired after 1980. Boston University will continue to pay property taxes on a portion of the Proposed project site which was acquired from Texaco. This amounts to an annual payment of $23,714.

CONCLUSION

The Proposed Project is critically important to the sensible growth of the Kenmore Square area. The urban design elements of the Proposed Project reflect the needs of Kenmore Square, while respecting the public goals and guidelines established for development in Boston, and the Proposed Project will aid the City financially. Further, the Development Plan satisfies the criteria for Development Plans and Development Impact Project Plans set forth in Sections 3-1A, 26A-3 and 26B-3 of the Code and otherwise complies with Sections 3-1A, 26A-3 and 26B-3 of the Code.

Additionally, the extensive review process has altered the project reducing its height and bulk, thereby resulting in a building more compatible with the surrounding community. An understanding has been reached with area residents regarding their concerns which provides a sound basis for resolving outstanding issues during the completion of the Article 31 process. In light of these improvements and the public benefits from the Proposed Project, BRA staff recommends that the Authority: (1) approve the attached Development Plan and Development Impact Project Plan and authorize the Director to execute the attached Development Impact Project Agreement and the Cooperation Agreement for the Proposed Project; (2) authorize the Director to petition the Zoning Commission for the designation of the Planned Development Area; (3) authorize the Director to recommend approval, conditional upon design review, of the petition to the Zoning Board of Appeal for conditional use permits, variances, or exceptions required in connection with the Proposed Project; (4) authorize the Director to issue an Adequacy Determination with respect to the Final Project Impact Report upon completion of the Article 31 review process; (5) approve the Schematic Design;

and (6) authorize the Director to take all actions and execute all documents deemed necessary and appropriate relative to the Development Plan.

Appropriate votes follow:

VOTED: That with respect to the Proposed Project at 595 Commonwealth Avenue (the "Proposed Project"), presented to the Boston Redevelopment Authority at a public hearing on June 10, 1993 by Boston University (the "Applicant" or the "University"), the Boston Redevelopment Authority hereby issues the following findings, approvals, and authorizations:

VOTED: That in connection with the Development Plan and Development Impact Project Plan for Planned Development Area No. 43 (the "Development Plan"), presented at a public hearing duly held at the offices of the Boston Redevelopment Authority (the "Authority") on June 10, 1993 and after consideration of evidence presented at, and in connection with, the hearing and in connection with the proposed development described in the Development Plan, including a report entitled "Boston University School of Management Draft Project Impact Report," submitted by the University to the Authority and dated February, 1993, the Authority finds with respect to the Development Plan that (1) the Development Plan conforms to the general plan for the City as a whole; (2) nothing in the Development Plan will be injurious to the neighborhood or otherwise detrimental to the public welfare; and (3) the Development Plan does adequately and sufficiently satisfy all other development plan criteria and specifications for a Planned Development Area and for a Development Impact Project Plan, as set forth in the Boston Zoning Code, as amended (the "Code"); and further

VOTED: That the form and substance of the Development Plan and Development Impact Project Plan, and the procedures employed in reviewing and approving the Development Plan and Development Impact Project Plan, conform with the requirements of the Code as applied to a Development Plan for a Planned Development Area under Section 3-1A of the Code and a Development Impact Project Plan under Articles 26A and 26B of the Code; and further

VOTED: That the Authority hereby waives any procedural requirements of the Authority's "Zoning Procedures for the Master Plan/PDA" dated March 14, 1986 with which the request submitted by the Applicant for a Planned Development Area designation for the parcel of land which is the subject of the Development Plan and for approval of the Development Plan is not in conformity; and further

VOTED: That pursuant to the provisions of Section 3-1A and Articles 26A and 26B of the Code, the Authority hereby approves the Development Plan and the Development Impact Project Plan. The Development Plan and the Development Impact Project Plan is embodied in a written document entitled "Development Plan and Development Impact Project Plan for Planned Development Area No. 43," dated June 10, 1993, consisting of 6 pages of text plus attachments designated Exhibits A through G, and is attached hereto as Exhibit A. The Development Plan shall be on file at the office of the Authority; and further

VOTED: That with respect to the Development Impact Project Agreement and the Cooperation Agreement presented to the Authority at its public hearing on June 10, 1993, the BRA hereby authorizes the Director in the name and on behalf of the Authority (1) to execute (a) a Development Impact Project Agreement for the Proposed Project, in the form attached hereto as Exhibit B with such changes as deemed necessary and appropriate by the Director and the Chief General Counsel; and (b) to execute all other necessary agreements and documents incidental to the Development Plan with such changes as the Director and Chief General Counsel determine to be necessary or desirable; (2) to execute a Cooperation Agreement in the form attached hereto as Exhibit C with such changes as deemed necessary and appropriate by the Director and the Chief General Counsel; and (3) to certify in the name of the Authority that plans submitted to the Inspectional Services Commissioner in connection with said project are in conformity with said Development Plan, the Director's certification to be conclusive evidence of said determination; said agreements to be on file in the Office of the Authority; and further

VOTED: That the BRA hereby authorizes the Director to petition the Zoning Commission of the City of Boston (the "Commission") for a Planned Development Area designation for the parcel of land which is the subject of the Development Plan for Planned Development Area No. 43 and to recommend to the Commission that it approve such petition and the Development Plan pursuant to Section 3-1A of the Code; and further

VOTED: (a) That whereas in order for the Board of Appeal of the City of Boston (the "Board of Appeal") to grant certain exceptions from the provisions of the Boston Zoning Code, including exceptions with respect to the floor area ratio, setbacks, yard requirements, certain other dimensional features of the Development, parking, loading, uses, and procedural requirements in accordance with

Section 6A-3 of the Code, it must find (1) that each requested exception is "in harmony with the general purpose and intent" of the Code; (2) that each requested exception is in conformity with the applicable Development Plan, and that the Authority has so certified; and (3) that the Development complies with the Development Impact Project requirements of the Code, the Authority finds that, for reasons set forth above, and based upon a review of the Applicant's Development Plan, the above-stated criteria are satisfied as to each of the exceptions listed in the schedule entitled "Anticipated Zoning Exceptions" attached as Exhibit G to the Development Plan (the "Zoning Requests"); and further

(b) That pursuant to Section 6A-2 of the Code, the Authority hereby authorizes the Director of the Authority to recommend to the Board of Appeal approval of the Zoning Requests, with such changes as the Director of the Authority, in his discretion, shall determine to be necessary or desirable, his taking of any such action to be conclusive evidence of his determination and of the authority granted to him hereunder; which approvals are recommended by the Authority provided that the Commission will have adopted a Map Amendment designating the land involved as a B-4-D Zoning District. The Authority hereby authorizes the Director of the Authority to certify to the Commission and the Board of Appeal that said exceptions requested on appeal are in conformity with the Development Plan; and further

VOTED: That with respect to Development Review of the Proposed Project under Article 31 of the Boston Zoning Code, as amended, the BRA hereby authorizes the Director to execute, in the name and on behalf of the BRA, an Adequacy Determination upon completion of the Authority's Article 31 process with respect to the Final Project Impact Report for the Boston University School of Management Project, 595 Commonwealth Avenue; and further

VOTED: That the Authority hereby approves the Schematic Design for the Project which is the subject of the Development Plan (as set forth on the documents listed on Exhibit D to the Cooperation Agreement attached hereto as Exhibit D); and, in accordance with Section 28-15 of the Code, hereby approves the design for the Proposed Project; and further

VOTED: That the Authority hereby authorizes the Director to certify to the Inspectional Services Commission that the Development complies with the Development Review Requirements of the Code, his certification of such to be conclusive evidence of his determination and of the authority granted to him hereunder; and further

VOTED: That the Authority hereby authorizes the Director to take all actions and execute all documents deemed necessary and appropriate by the Director and the Chief General Counsel in connection with the Development Plan and the Development Impact Project Plan.

VOTED: That Boston University, through its private geotechnical consultant, shall prepare a plan to address any and all changes in the water table both during the construction phase and following project completion. Such plan shall be reviewed by the Authority.

dp0609

BOSTON REDEVELOPMENT AUTHORITY

DEVELOPMENT PLAN
and
DEVELOPMENT IMPACT PROJECT PLAN
for
PLANNED DEVELOPMENT AREA NO. 43

595 Commonwealth Avenue

Trustees of Boston University

June 10, 1993

Development Plan: In accordance with Section 3-1A of the Boston Zoning Code (the "Code"), this development plan and development impact project plan (the "Development Plan") sets forth information on the proposed development (the "Project") of 595 Commonwealth Avenue, a site of approximately 1.14 acres (the "Site"), including the proposed location and appearance of structures, open spaces and landscaping, proposed uses of the Site, densities, proposed traffic circulation, parking and loading facilities, access to public transportation and proposed dimensions of structures. This Development Plan represents the first stage in the planning process for the improvement of the Site. In the next stages of the development process, design development plans and final plans and specifications for the Project will be submitted to the Boston Redevelopment Authority (the "BRA") pursuant to Section 3-1A of the Code for final design review approval and certification as to consistency with this Development Plan. This Development Plan consists of 6 pages of text plus attachments designated Exhibits A through G. All references to this Development Plan contained herein shall pertain only to such 6 pages and exhibits. Exhibits A through G are subject to final design, environmental and other development review by the BRA and by other governmental agencies and authorities. This Development Plan is also intended to satisfy the requirements of Article 26A and Article 26B of the Code regarding Development Impact Project Plans.

Developer: Trustees of Boston University, a Massachusetts nonprofit, educational corporation, its successors and assigns (the "University").

Location and Description of Site: The Site consists of a parcel of land containing approximately 49,686 square feet or approximately 1.14 acres, located at 595 Commonwealth Avenue, Boston, Suffolk County, Massachusetts, as more particularly bounded and described in Exhibit A attached hereto and as shown on a plan entitled "Topographic Site Plan Boston University 587-599 Commonwealth Avenue Boston, Mass", dated January 6, 1992, revised February 11, 1992, October 29, 1992, March 23, 1993 and April 27, 1993, prepared by Harry R. Feldman, Inc. and attached hereto as Exhibit B.

Proposed Location and Appearance of Structures: As currently planned, the Project will include the construction of a single structure ("595 Commonwealth Avenue"), rising nine (9) stories above the grade of Commonwealth Avenue. This above-grade structure will be constructed above a three (3) level parking facility located below the grade of Commonwealth Avenue. It is currently anticipated that 595 Commonwealth Avenue will be located approximately as shown on Exhibit C attached hereto. 595 Commonwealth Avenue will have heights and a gross floor area not in excess of those set forth on Exhibit D attached hereto. All references herein to "gross floor area" refer to that term as defined in the Code.

The elevations and the building section attached hereto as Exhibit E illustrate the general appearance of 595 Commonwealth Avenue. The final location and appearance of 595 Commonwealth Avenue are subject to final design, environmental and other development review by the BRA and other governmental agencies and authorities.

Incidental to the construction of the Project will be the demolition of the buildings currently located on the Site.

Proposed Open Spaces and Landscaping: The creation of new landscaping along Commonwealth Avenue and Sherborn Street as well as new sidewalk materials and other streetscape improvements are presently planned in connection with the Project. These improvements will include a variety of paving materials, lighting, trees, shrubs and ground cover.

Proposed Uses of the Area: The Project is planned to include educational and other institutional uses, eating places, office uses, parking and uses ancillary, accessory, incidental and/or auxiliary to any of the foregoing uses, including roadways and pedestrian areas for access through the Site. The proposed uses planned for the Project may include those uses listed in Exhibit F attached hereto.

Proposed Dimensions of Structures: 595 Commonwealth Avenue will have heights and a gross floor area not in excess of those set forth on Exhibit D attached hereto. Upon establishment of the PDA, the Site will be located in a B-4-D zoning district. In such districts, relief from the requirements of the Code may be sought as exceptions pursuant to Article 6A of the Code. Exhibit G attached hereto sets forth a list of anticipated zoning exceptions required for the Project. Because the design of the Project is subject to further design, environmental and other development review by the BRA and other governmental agencies and authorities, the zoning relief required for the Project may change correspondingly.

Proposed Densities: The Site is located in a B-4, General Business Zoning District, in which the maximum floor area ratio ("FAR") under the Code is 4.0. This Development Plan provides for an overall FAR of 6.5 for the Site based upon the ratio of 322,959 square feet of gross floor area (calculated as described in the Code) to the existing land area of the Site of approximately 49,686 square feet.

Development Impact Project Contribution: As required under Section 26A-3 of the Code, the University will enter into a Development Impact Project Agreement (the "DIP Agreement") with the BRA and will be responsible for making a Development Impact Project Contribution (the "DIP Contribution") with regard to the Project, to the extent required by the DIP Agreement. As required under Section 26B-3 of the Code, the University will also be responsible for making a Jobs Contribution with regard to the Project, to the extent required by the DIP Agreement. It is anticipated that 595 Commonwealth Avenue will contain approximately 321,700 square feet of gross floor area devoted to certain uses enumerated in Table D of Article 26A of the Code and Table E of Article 26B of the Code, including, without limitation, use No. 16A under the Code and other institutional and educational uses.

Projected Number of Employees: It is estimated that the Project will generate approximately 300 construction jobs in the City of Boston and that approximately 480 people will be employed at the Site when the Project is completed.

Proposed Traffic Circulation: Vehicular access to and egress from 595 Commonwealth Avenue is expected to be on Commonwealth Avenue and Sherborn Street. Current plans provide for an entrance to the parking garage to be located along the southeast corner of 595 Commonwealth Avenue. Interior circulation within the garage will be via a ramp system.

Proposed Parking and Loading Facilities: The garage planned for the Site will provide up to 270 parking spaces. As currently planned, the Project will include a three bay loading dock with one bay being devoted to a trash compactor/dumpster.

Access to Public Transportation: The Site is located on the Commonwealth Avenue branch of the MBTA Green Line. A trolley stop is located directly in front of the Site, on Commonwealth Avenue at Sherborn Street. MBTA buses running between Watertown and Kenmore Square travel along Commonwealth Avenue with a stop at the corner of Commonwealth Avenue and Sherborn Street, and MBTA buses running between Central Square in Cambridge and Boston City Hospital in the South End also travel along Commonwealth Avenue with a stop at the BU Bridge. In addition, Kenmore Square, to the east of the Site, is a major public transportation hub.

Development Review Procedures: All design plans for the Project are subject to ongoing development review and approval by the BRA. Such review is to be conducted in accordance with the BRA's "Development Review Procedures" dated 1985, revised 1986 in the form attached to, and as affected by, the Cooperation Agreement for the Site.

Public Benefits: The Project is expected to result in positive benefits to the City and to several neighborhoods which are adjacent to or near the University. These public benefits are expected to include (1) added vitality and safety along sections of Commonwealth Avenue and Sherborn Street bordering the Site, (2) the satisfaction of urban design objectives by filling the visual gap presented by the existing uses of the site, (3) the creation of a visual gateway at the eastern end of the University's Commonwealth Avenue campus, (4) pedestrian improvements with new landscaped areas and streetscaping elements, (5) improved pedestrian and traffic safety along Commonwealth Avenue, (6) the expansion of markets for Kenmore Square area businesses due to an influx of students and University employees and (7) providing that abutting landowners approve, the paving of the alley to the rear of the Site, leading to improved access and safety.

From a financial and economic perspective, the Project is expected to contribute significantly to Boston's economy by adding approximately 300 construction jobs in the City of Boston. It is also anticipated that approximately 480 people will be employed at the Site when the Project is completed. With approximately 9,600 employees, the University is among the largest private employers in Boston.

Attachments:

Exhibit A:	Legal Description
Exhibit B:	Plan entitled "Topographic Site Plan Boston University 587-599 Commonwealth Avenue Boston, Mass"
Exhibit C:	Plan showing approximate location of 595 Commonwealth Avenue
Exhibit D:	Maximum Building Heights and Gross Floor Area
Exhibit E:	Elevations and Building Section
Exhibit F:	Table of Proposed Uses
Exhibit G:	Anticipated Zoning Exceptions

EXHIBIT A
to PDA Development Plan

(exhibit begins on next page)

A parcel of land, in Boston, Suffolk County, Massachusetts, shown on a plan entitled "Topographic Site Plan Boston University 587-599 Commonwealth Avenue Boston, Mass", dated January 6, 1992, revised February 11, 1992, October 29, 1992, March 23, 1993 and April 27, 1993, prepared by Harry R. Feldman, Inc., bounded and described according to said plan as follows:

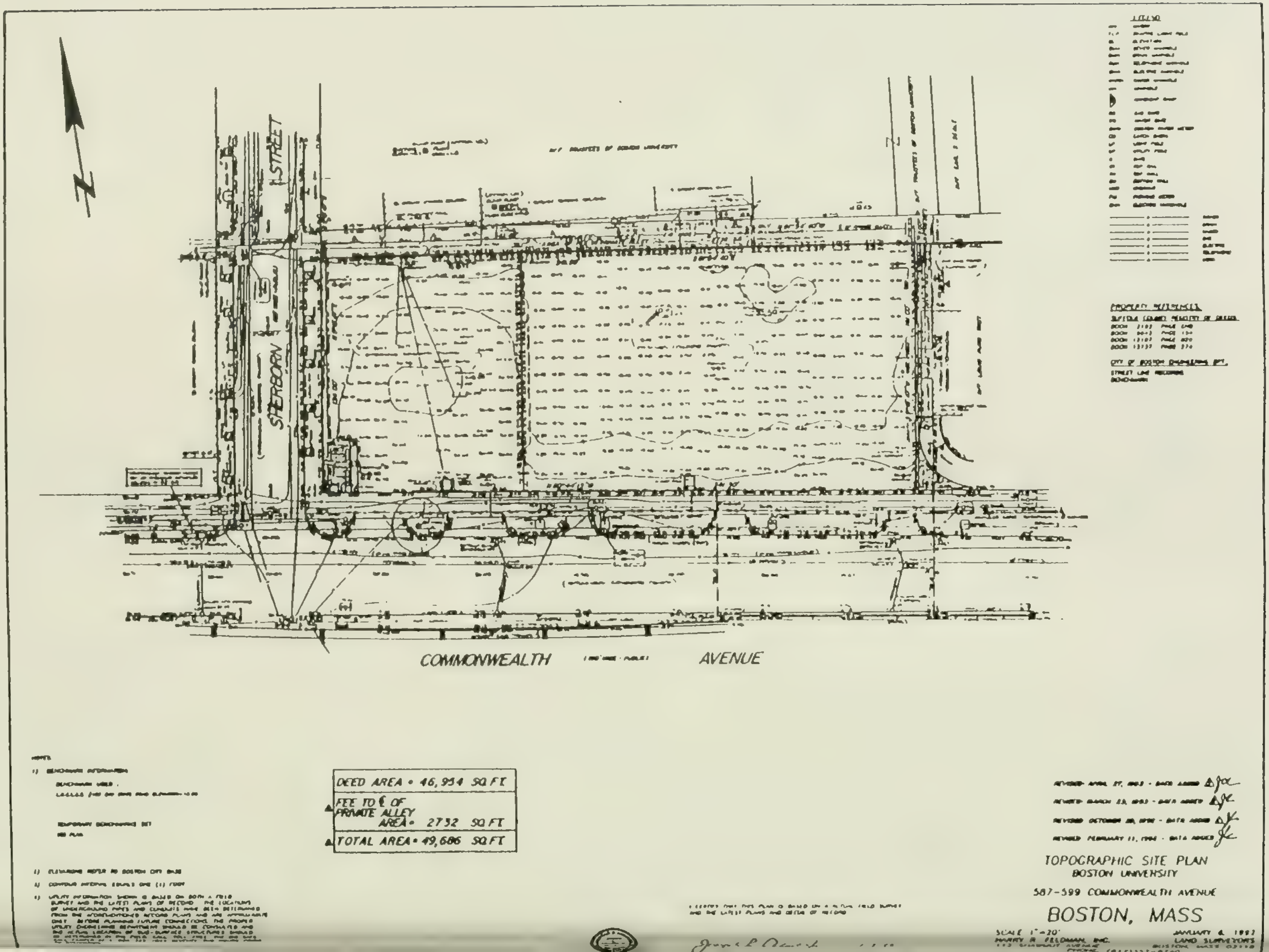
SOUTHERLY	by Commonwealth Avenue, 341.50 feet;
WESTERLY	by Sherborn Street, 142.00 feet;
NORTHERLY	by the center line of a Private Alley, 341.42 feet; and
EASTERLY	by land now or formerly of Louis Puro, Trustee, 141.00 feet.

Containing 49,686 square feet according to said plan.

EXHIBIT B

to PDA Development Plan

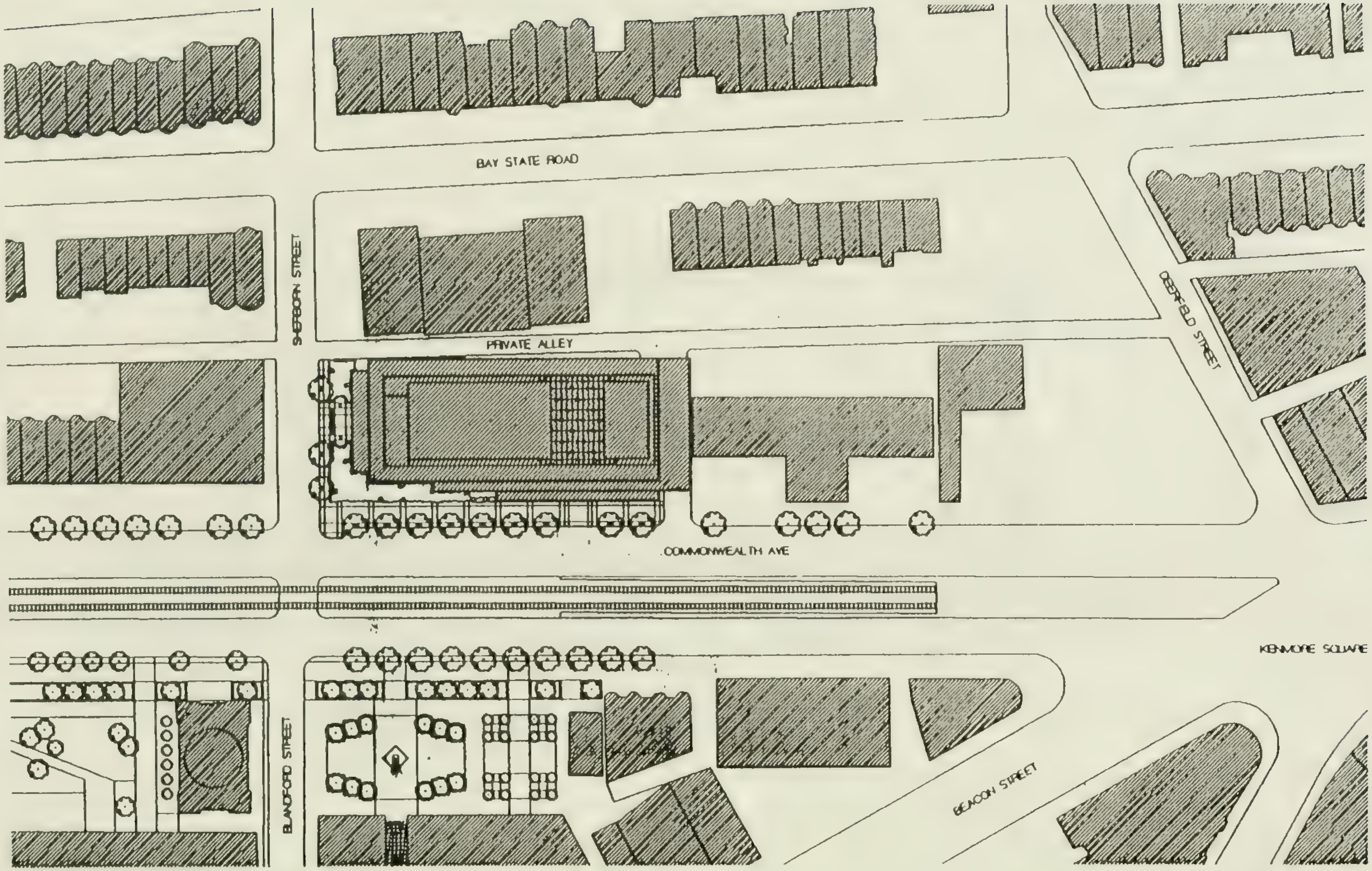
(exhibit begins on next page)



N
SHERBORN STREET
COMMONWEALTH AVENUE
DEED AREA • 46,954 SQ FT
FEE TO ℄ OF PRIVATE ALLEY AREA • 2732 SQ FT
TOTAL AREA • 49,686 SQ FT
TOPOGRAPHIC SITE PLAN
BOSTON UNIVERSITY
587-599 COMMONWEALTH AVENUE
BOSTON, MASS
SCALE 1"=20'
HARRY R. FELDMAN, INC.
LAND SURVEYORS

EXHIBIT C
to PDA Development Plan

(exhibit begins on next page)


BAY STATE ROAD
SHERBORN STREET
PRIVATE ALLEY
DEERFIELD STREET
COMMONWEALTH AVE
KENMORE SQUARE
BLANDFORD STREET
BEACON STREET
True North
Project North
0
50'
100'

SITE PLAN

EXHIBIT D
to PDA Development Plan

(exhibit begins on next page)

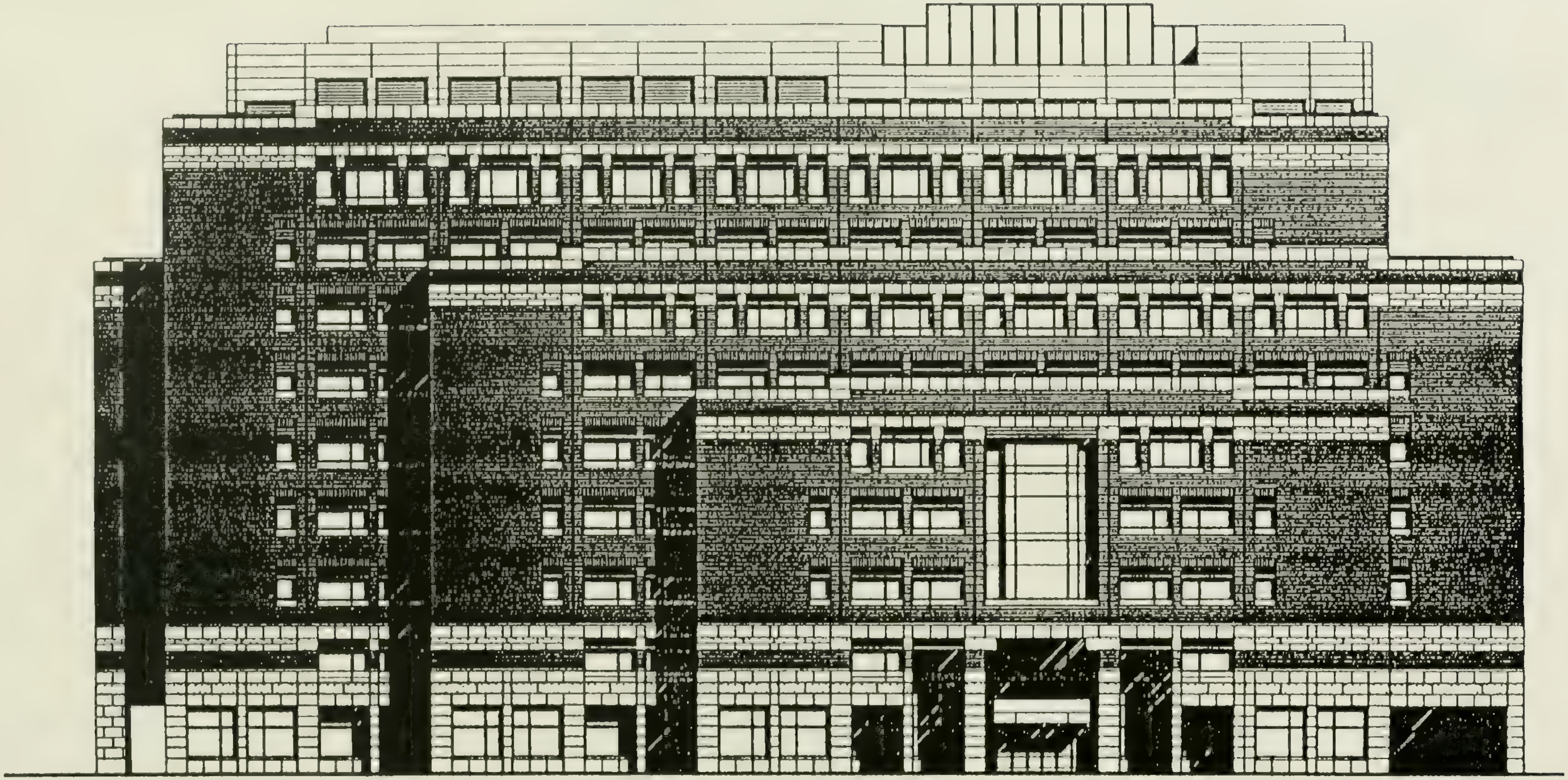
MAXIMUM BUILDING HEIGHTS AND GROSS FLOOR AREA

	Gross Floor Area Not to Exceed (square feet)	Height Not to Exceed (stories/feet and inches above grade, as defined in the Code)
595 Commonwealth Avenue	322,959	9 (plus mechanical penthouse)/166'2"

The parking garage to be located in 595 Commonwealth Avenue will be situated below the average grade of Commonwealth Avenue as it abuts the Site. Because the Code excludes from the definition of "gross floor area" any garage space which is in the basement of a building, and because the Code defines basement as "that portion of a building which is partly or completely below grade", the floor space devoted to parking which is to be located in 595 Commonwealth Avenue is not included in the "gross floor area" figure provided on this table or elsewhere in this Development Plan.

EXHIBIT E
to PDA Development Plan

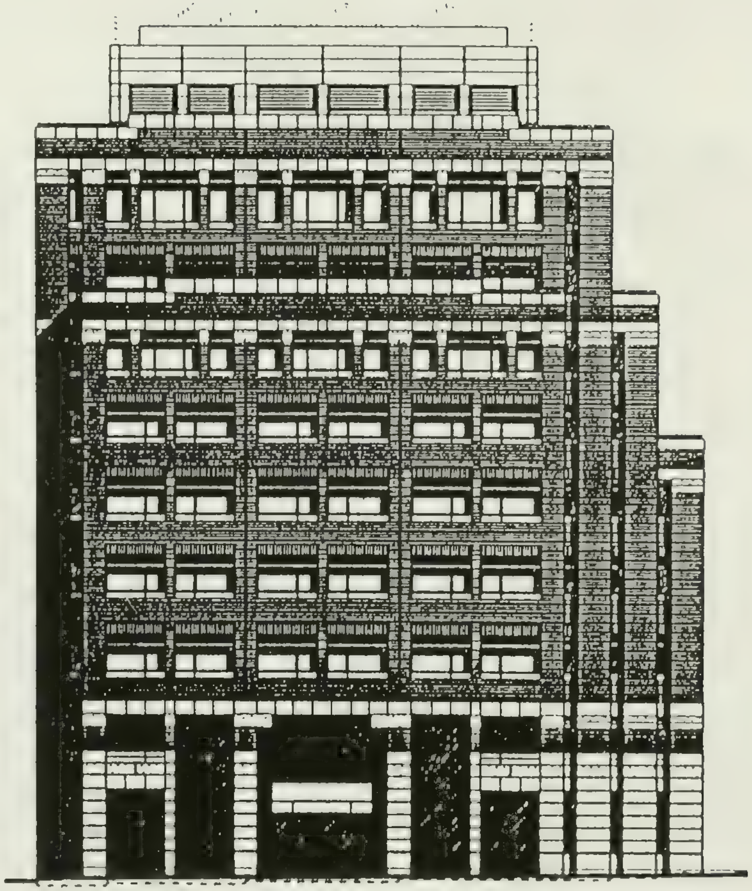
(exhibit begins on next page)



BOSTON UNIVERSITY
SCHOOL OF MANAGEMENT

SOUTH ELEVATION
(9 STORY BUILDING)

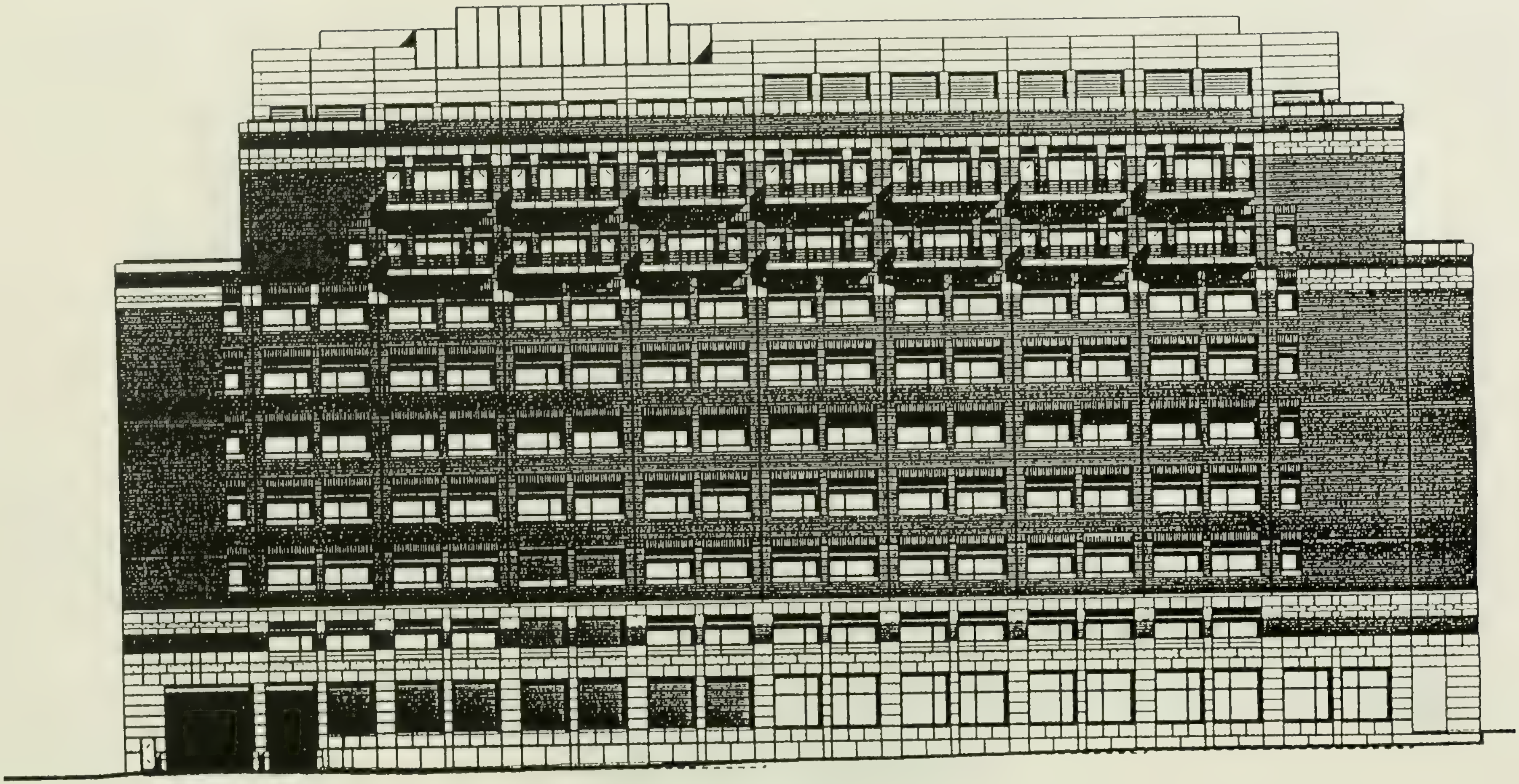
7 JUNE 1993



BOSTON UNIVERSITY
SCHOOL OF MANAGEMENT

WEST ELEVATION
(9 STORY BUILDING)

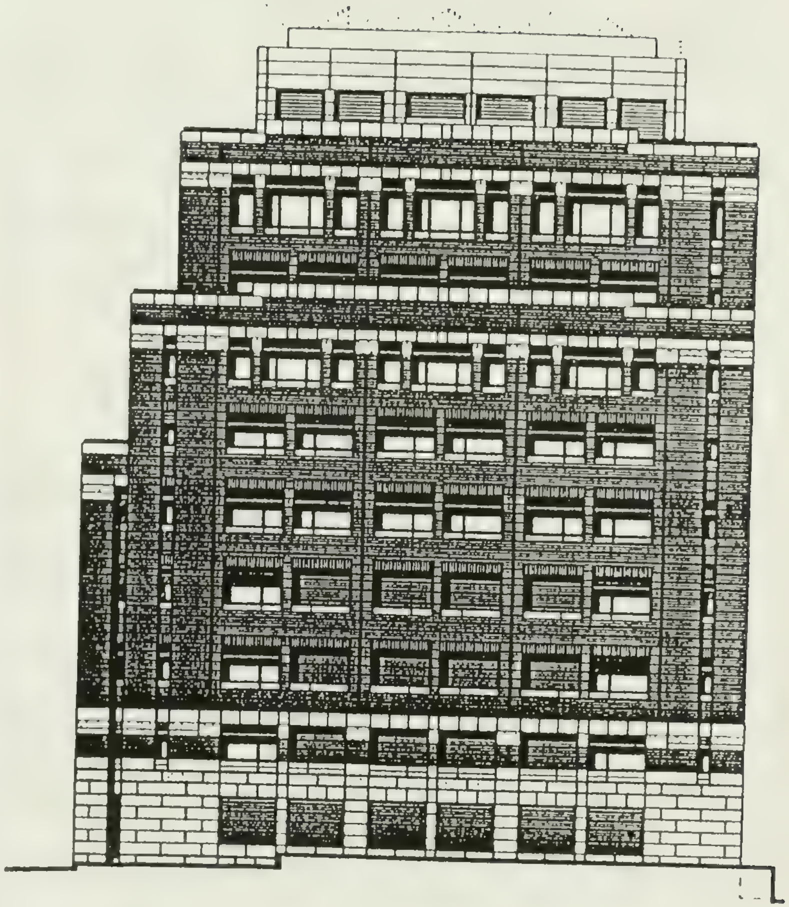
7 JUNE 1993



BOSTON UNIVERSITY
SCHOOL OF MANAGEMENT

NORTH ELEVATION
(9 STORY BUILDING)

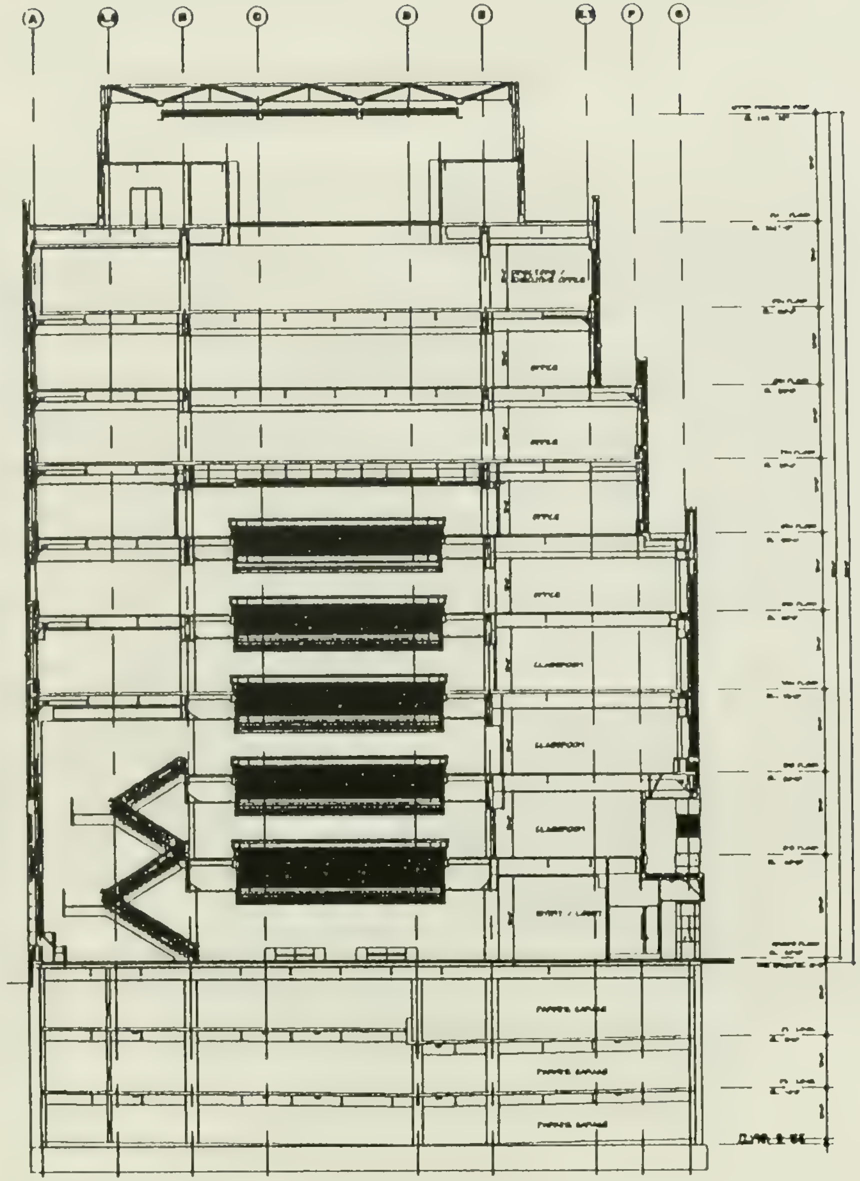
7 JUNE 1993



BOSTON UNIVERSITY
SCHOOL OF MANAGEMENT

EAST ELEVATION
(9 STORY BUILDING)

7 JUNE 1993



BOSTON UNIVERSITY
SCHOOL OF MANAGEMENT

BUILDING SECTION
(9 STORY BUILDING)

7 JUNE 1993

EXHIBIT F
to PDA Development Plan

(exhibit begins on next page)

TABLE OF PROPOSED USES

USE NO.	USE
16A	College or university granting degrees by authority of the Commonwealth of Massachusetts
18	Trade, professional or other school
20A	Library or museum not conducted for profit, and accessory to, a use listed under Use Item No. 16A, 18, 22, 23, or 24, whether or not in the same lot
24	Scientific research and teaching laboratories not conducted for profit and accessory to a use listed under Use Item No. 16, 16A, 18, 22, or 23, whether or not on the same lot, provided that all resulting cinders, dust, flashing, fumes, gases, odors, refuse matter, smoke and vapor are effectively confined to the lot or so disposed of as not to be a nuisance or hazard to health or safety; and provided also that no noise or vibration is perceptible without instruments more than fifty feet from the lot or any part of the lot.
29	Adult education center building
34	Store primarily serving the local retail business needs of the residents of the neighborhood, but not constituting a business as described in Use Item No. 34A, including, but not limited to, store retailing one or more of the following: food, baked goods, groceries, packaged alcoholic beverages, drugs, tobacco products, clothing, dry goods, books, flowers, paint, hardware and minor household appliances
36A	Sale over the counter, not wholly incidental to a use listed under Use Item

No. 34 or Use Item No. 37 or Use Item No. 50, of on-premises prepared food or drink for off-premises consumption or for on-premises consumption if, as so sold, such food or drink is ready for take-out

37 Lunch room, restaurant, cafeteria or other place for the service or sale of food or drink for on-premises consumption, provided that there is no dancing nor entertainment other than phonograph, radio and television, and that neither food nor drink is served to, or consumed by, persons while seated in motor vehicles

38 Place for sale and consumption of food and beverages (other than drive-in restaurant) providing dancing or entertainment or both; theatre (including motion picture theatre but not drive-in theatre); concert hall; dance hall; ... provided that such establishment is customarily open to the public at large and does not exclude any minor by reason of age as a prevailing practice

39 Office of accountant, architect, attorney, dentist, physician, or other professional person, not accessory to a main use

40 Real estate, insurance or other agency office

41 Office building, post office, bank (other than drive-in bank) or similar establishment

59 Parking garage

71 Any use on a lot adjacent to, or across the street from, but in the same district as, a lawful use to which it is ancillary and ordinarily incident and for which it would be a lawful accessory use if it were on the same lot; any such use on such a lot in another district unless such use is

a use specifically forbidden in such other district

71 As an accessory use subject to the limitations and restrictions of Article 10, a garage or parking space for occupants, employees, customers, students and visitors; provided that, in the case of a lot lying in two or more districts, such parking is accessory to a use that is lawful in the district in which such parking is located

73 As an accessory use subject to the limitations and restrictions of Article 10, in hospitals with more than fifty beds, and in educational institutions with more than four hundred full time students, incidental uses and services ordinarily found in connection therewith and primarily for the patients and staff or students and faculty, when conducted wholly within a building and entered solely from within the building where there is but one building on the lot or from an entrance not directly facing a street or lot line where there is more than one building on a lot

81 As an accessory use subject to the limitations and restrictions of Article 10, the storage of flammable liquids and gases incidental to a lawful use

83 As an accessory use subject to the limitations and restrictions of Article 10, any use ancillary to, and ordinarily incident to, a lawful main use

Exhibit 3
to PDA Development Plan

(exhibit begins on next page)

ANTICIPATED ZONING EXCEPTIONS

Use Item Nos. 16A, 18, 20A, 24, 36A, 59, 71, 72, 79 and 85

3-1A(c) Restricted Parking District

11 Signs

22 Yard Regulations

Article		Requirements	Proposed
15	Floor Area Ratio	4.0	6.5
19	Side Yards	East - 16.75'	.17'
20	Rear Yards	20'	8.5'
21	Setbacks of Parapet	North - 81.2' South 31.2' East - 50.2' West - 20.2'	North 8.5' South - none East - .17' West - 20.66'
24	Off-Street Loading	5	3, with one devoted to a trash compactor/ dumpster

As required by the Code, the calculation of parapet setback requirements set forth above is based on the formula $\frac{H+L'}{6}$ and the provisions of Article 21. Determining the applicable requirement for each face of a building wall, as anticipated by the Code, would require several calculations for each side of the building because of the numerous setbacks in building depth and height. Instead, the requirements set forth above are based upon the "worst case", viewing each side of the building as a whole, by inserting the maximum height and length of each side of the building into the formula. The proposed parapet setbacks of the building are the minimum anticipated setback from lot lines of each side of the building although these numbers (like the side yard and rear yard parapet setbacks) may change based upon continuing development review.

ca0728
Blacklined v. ca0623

COOPERATION AGREEMENT

FOR

PLANNED DEVELOPMENT AREA NO. 43

595 COMMONWEALTH AVENUE

TRUSTEES OF BOSTON UNIVERSITY

AGREEMENT made as of the ____ day of ________, 1993 by and between the BOSTON REDEVELOPMENT AUTHORITY, a public body politic and corporate created pursuant to Chapter 121B of the Massachusetts General Laws, as amended, acting in its capacity as the planning board for the City of Boston (the "Authority"), and TRUSTEES OF BOSTON UNIVERSITY, a Massachusetts non-profit, educational corporation, or its designee(s) (the "University").

WHEREAS, the University wishes to undertake the development of a certain parcel of land in the City of Boston (the "City") known as 595 Commonwealth Avenue and more particularly described in Exhibit A (the "Site");

WHEREAS, the University submitted /\ **a Development Plan and Development Impact Project Plan (the "Development Plan") to the Authority** for designation of the Site as Planned Development Area Number 43 /\ for the Site;

WHEREAS, the Development Plan was approved by the Authority on ∧ **June 24,** 1993 (the "Vote"), after a public hearing at its meeting held on June 10, 1993, notice of which hearing was published in *The Boston Herald* on June 1, 1993 and June 4, 1993, a certified copy of which Vote is attached hereto as Exhibit B; and

WHEREAS, the University proposes to construct on the Site (a) a new building consisting of approximately 321,700 gross square feet, of nine (9) stories in height for the Boston University School of Management (the "Building") and (b) a three (3) level parking facility located below the grade of Commonwealth Avenue below the (9) story new building (the "Parking Facility"; together the Building and the Parking Facility are referred to as the "Project");

NOW, THEREFORE, in consideration of the mutual covenants and agreements herein contained, the parties agree as follows:

1. The Authority will petition the Zoning Commission of the City of Boston (the "BZC") on behalf of the University to designate the Site as a PDA.

2. The University will, subject to section 14 hereof, proceed with the planning, design and development of the Site in a manner consistent with the development concept, land uses, density and building heights contemplated in the Development Plan (as such plan may be amended). The Development Plan is attached hereto as Exhibit C.

3. The Authority acknowledges that it has completed its review in connection with the Development Plan and the Schematic Design for the Site (as set forth on the documents listed on Exhibit D attached hereto). Subject to section 14 hereof, it is understood and agreed that no development of the Site will be undertaken except in accordance with a PDA development plan approved by the Authority and the BZC, and in accordance with the terms of this Agreement.

4. The Applicant is in the process of completing a development review in accordance with Article 31 of the Boston Zoning Code and the Scoping Determination required by the Authority dated October 27, 1992, which Scoping Determination is attached hereto as Exhibit F, and incorporated herein (the "Scoping Determination"). The Authority acknowledges submission by the University of the Draft Project Impact Report for the Project dated February, 1993 and received by the Authority on February 22, 1993 and notice thereof was published in the Boston Herald on February 25, 1993. The University expects to submit a Final Project Impact Report for the Project. The Authority may require the University to take reasonable, practical measures, including, without limitation, economical measures consistent with the scope of the proposed development of the Site as presently conceived, to mitigate potential damage to the environment identified in the Final Project Impact Report as approved by the Authority.

5. The University shall submit a Traffic Management Plan (the "TMP") for the Project to the Commissioner of Transportation of the City of Boston (the "Commissioner of Transportation") for his approval, which approval shall not be unreasonably withheld or delayed, prior to issuance of a building permit for the construction of any portion of the Project on the Site (including therein the demolition of existing structures or the construction of infrastructure or other Site improvements) (a "Permanent Building"). The TMP will identify construction, traffic, and parking impacts and specify mitigating measures to be implemented during the construction of any portion of the Project that are reasonably satisfactory to the Commissioner of Transportation.

6. The University shall submit a Transportation Access Plan (the "TAP") for the Project to the Commissioner of Transportation. The TAP shall identify traffic and parking impacts of the Project and describe potential mitigating measures and development goals. Provided that the Commissioner of Transportation does not unreasonably withhold or delay his approval thereof, the University shall also enter into a Transportation Access Plan Agreement (the "TAP Agreement") with the Commissioner of Transportation prior to the issuance of a building permit for any Permanent Building. The TAP Agreement will identify mitigating measures and development goals that are reasonably satisfactory to the Commissioner of Transportation.

7. Except as otherwise set forth herein, the University and the Authority hereby agree that the development review process required by the Development Plan for the Site, which development review process is to be observed by the parties (the "Development Review Process"), shall be as set forth in /\ **Article 31 of the Boston Zoning Code, the Scoping Determination issued thereunder and the Authority's Development Review Procedures dated 1985, revised 1986 attached hereto as Exhibit G and incorporated herein (the "Development Review Procedures")**, including reviews of the Development Concept, Schematic Review, Design Development and Contract Documents. Capitalized terms used and not defined herein shall have the meanings ascribed to them in the Development Review Procedures.

8. Throughout the Development Review Process discussed in section 7 above, and in connection with the development of the Project, the University will submit to the Authority the submissions required by the Development Review Process /\ . Once approval of any submission has been given (or deemed given) by the Authority, review of subsequent submissions shall be limited to the development or refinement of elements shown on previously approved submissions or to elements that were not shown on previously approved submissions.

Prior to the approval of Contract Documents for the Project, it shall be the University's responsibility to notify the Authority of proposed material changes from previously approved submissions (other than refinements of details generally consistent with such previously approved submissions) with regard to the design of exterior features of buildings, portions of public lobbies that are visible from the exterior of buildings, open spaces and landscaping, and to obtain approval from the Authority prior to incorporating such proposed changes into the drawings and specifications. With regard to such a proposed change, the Authority shall perform its functions under this provision promptly and with all reasonable dispatch and in accordance with the provisions of this Agreement, and, with regard to such a proposed change made after Design Development, (i) approve or disapprove such proposed change within /\ **fourteen (14)** days of its submission to the Authority and (ii) if disapproving such a proposed change, include with such disapproval a detailed written explanation therefor. If the University receives no notification from the Authority of disapproval within /\ **fourteen (14)** days after submission of such a proposed change, such proposed change shall be deemed approved.

9. Once Contract Documents for the Project have been approved, the only further submissions to be made by the University to the Authority for review and approval hereunder will be requests for change orders /\ **involving any subsequent material changes in design or materials to exterior features of buildings, portions of public lobbies, that are visible from the exterior of buildings, open spaces and landscaping** ("Change Orders"). **Change**

Orders shall receive approval from the Authority prior to implementation. The Authority shall (i) perform its functions under this provision promptly and with all reasonable dispatch, and shall approve or disapprove Change Orders within /\ **fourteen (14)** days of their submission to the Authority, and (ii) if disapproving a Change Order, include with such disapproval a detailed written explanation therefor. If the University receives no notification from the Authority of such disapproval within /\ **fourteen (14)** days after submission of such Change Order, such Change Order shall be deemed approved. Notwithstanding the foregoing, the Authority's approval shall not be required for Change Orders effecting changes which will not be visible from the exterior of buildings, including without limitation changes to portions of public lobbies that are not visible from the exterior of buildings.

10. The Authority will informally advise the University concerning, and will actively cooperate with and publicly support, the University's efforts to obtain from the appropriate municipal, state and federal bodies and agencies all permits, licenses and approvals, and exceptions, variances and other departures from the normal application of the applicable zoning and building codes and other ordinances and statutes, which may be necessary or convenient in order to carry out the development of the Site in accordance with the Development Plan in the most expeditious and reasonable manner. After approval by the Authority of an

amendment or amendments to the existing Development Plan for the Site, the Authority will forthwith informally advise the University concerning, and will actively cooperate with and publicly support, the University's efforts to obtain from the appropriate municipal, state and federal bodies and agencies all permits, licenses and approvals, and exceptions, variances and other departures from the normal application of the applicable zoning and building codes and other ordinances and statutes, which may be necessary or convenient in order to carry out the development of the Site in accordance with such subsequent amendment or amendments in the most expeditious and reasonable manner.

11. The Authority hereby approves the Schematic Design for the Site (as set forth on the documents listed on Exhibit D hereto).

12. The University acknowledges that, pursuant to the Development Plan, certain dimensional limitations will shape the character of the Project. The Authority agrees that it will not withhold or delay approval of design submissions with regard to the Project because of the heights of the structures portrayed in such submissions, provided that such heights are consistent with the Development Plan.

13. The University will execute a Boston Residents Construction Employment Plan, consistent with the requirements of the Boston Residents Jobs Policy established by Chapter 30 of the

Ordinances of 1983 and the Mayor's Executive Order Extending the Boston Residents Jobs Policy dated July 12, 1985, which sets forth in detail the University's plan to ensure that its general contractor, and those engaged by said general contractor for construction of the Project on a craft by craft basis, use good faith efforts to meet the following Boston Residents Construction Employment Standards: (1) at least 50% of the total employee worker hours in each trade shall be by bona fide Boston residents; (2) at least 25% of the total employee worker hours in each trade shall be by minorities; and (3) at least 10% of the total employee worker hours in each trade shall be by women. Said plan shall include provisions for monitoring, compliance and sanctions. Worker hours, as defined in said plan, may include, at the University's option, on-the-job training and apprenticeship positions.

14. If, in the future, the University shall, in its reasonable judgment, determine that it has become infeasible to proceed with the Project described in the approved Development Plan (as it may be amended), then in such case and after substantiation by the University deemed adequate by the Authority in its reasonable discretion of the reasons for not being able to proceed, the Authority shall cooperate with the University to modify, alter, or amend its previous approval of the Development Plan and this Agreement in order to allow the University the opportunity to reasonably develop the land that it owns. If the

parties acting in good faith cannot agree as to an appropriate modification, alteration, or amendment to the Development Plan, then the Director of the Authority agrees, upon the University's request, to (i) /\ **recommend to the Authority that the** PDA designation for the Site **be rescinded** if no portion of the Site has been developed in accordance with the Development Plan (and to recommend and publicly support such /\ **rescission by the BRA, the BZC and the Mayor) or (ii) recommend to the Authority that portion(s) of the Site be released** from the Development Plan /\ **if a portion (but not all) of the Site has been** developed in accordance with the Development /\ Plan (and to recommend and publicly support such release by the /\ **BRA, the BZC and the Mayor). Upon rescission of the entire** PDA designation for the Site, all obligations of the parties hereto shall terminate and be of no further force and effect with respect to this Agreement, any development plans and any development impact project plans and agreements. The University acknowledges that, under the current Boston Zoning Code, the Site would be governed by underlying zoning upon such /\ **rescission**.

For purposes of this Agreement, "Substantial Construction" shall mean excavation, foundation and construction work on the Project, but shall not include demolition, removal of oil, gasoline tanks or hazardous materials, relocation of infrastructure, or the conduct of borings, soils investigations, or similar activities whether or not the same require the issuance of a building permit or partial building permit.

15. The Authority acknowledges that, prior to approving the Development Plan pursuant to Sections 3-1A.a, 26A-3.1 and 26B-3.1 of the Boston Zoning Code, the Authority found that each of such plans conformed to the general plan for the City as a whole and that nothing in any such plans will be injurious to the neighborhood or otherwise detrimental to the public welfare.

16. Provided that work within the PDA has commenced and is diligently proceeding, the Authority will, within 30 days of a request by the University, file with the Building Commissioner of the City of Boston a certificate pursuant to Section 6A-1 of the Code indicating that work within the PDA has commenced and is diligently proceeding.

17. This Agreement shall be binding upon and enforceable against the successors and assigns of the parties hereto (other than mortgagees of the Site or those claiming through mortgagees of the Site, unless said party obtains title to the Site and proceeds with the development of the Project), it being understood and agreed that the University shall have a right, after notice to the Authority, to transfer or assign to another party or parties its rights, interests and obligations under this Agreement and any PDA master plans or development plans and in all or a portion of the Site.

18. The liability of the University or its successors or assigns (including, without limitation, mortgagees) arising under this Agreement shall be limited solely to the Project and shall not apply to other assets and property of the University or its successors or assigns. No partner, venturer, trustee, beneficiary, shareholder, officer, director or the like of the University or its successors or assigns, from time to time, or any such person's or entity's separate assets or property, shall have or be subject to any personal liability with respect to any obligation or liability of the University or its successors or assigns hereunder.

21. If any term or provision of this Agreement, or the application thereof to any person or circumstance, shall to any extent be invalid and unenforceable, the remainder of this Agreement, or the application of such terms to persons or circumstances other than those to which it is invalid or unenforceable, shall not be affected thereby, and each term and provision of this Agreement shall be valid and shall be enforced to the extent permitted by law. To the extent that any term or provision of this Agreement represents a contractual obligation that is also contained in any statute, ordinance, regulation or other law, such contractual obligation contained herein shall be invalid and unenforceable to the extent that such law or statute is deemed invalid or unenforceable or is inapplicable to the Development or a particular Project.

22. Whenever the consent or approval of the Authority is required hereunder, under the Development Review /\ Process, or otherwise, such consent or approval shall not be unreasonably withheld or delayed, or wherever there is a requirement that any thing, act or circumstance shall be satisfactory to the Authority or shall be done and performed to the Authority's satisfaction or any other requirement of similar import, the Authority covenants not to be unreasonable with respect thereto.

23. The University and the Authority have executed a Development Impact Project Agreement dated ___________, 1993 for the Project (the "DIP Agreement") and the University agrees that it shall comply with the provisions of the DIP Agreement.

24. The Authority shall, within ten **(10)** business days after written request therefor by the University or any mortgagee of the Project or any portion thereof, provide a certificate in recordable form, as requested or applicable, within /\ ten (10) business days after such a request, that this Agreement (or any particular section hereof specified by the requesting party) and the Development Plan are in full force and effect and unmodified, or in what respects the Agreement or the Development Plan are no longer in force and effect or have been modified, and that the University is in compliance with this Agreement (or any particular section hereof specified by the requesting party) and with the

Development Plan, or in what respects there is non-compliance, or as to any other matter reasonably related to the Development which the requesting party may reasonably request of the Authority.

25. The Authority hereby authorizes, to the extent permitted by law, the Director of the Authority to take any action hereunder on behalf of the Authority (including without limitation the granting of consents or approvals and the execution and delivery of certificates except for a certificate of completion), and any action so taken shall be binding upon the Authority.

26. All notices or other communications required or permitted to be given under this Agreement shall be in writing, signed by a duly authorized officer or representative of the Authority or the University, as the case may be, and shall either be hand-delivered or mailed postage pre-paid, by registered or certified mail, return receipt requested or mailed postage pre-paid by overnight mail, and shall be deemed given when delivered, if by hand, or when deposited with the U.S. Postal Service or with an overnight mail service, if mailed, to the principal office of the party to which it is directed, which is as follows unless otherwise designated by written notice to the other party:

University:
Trustees of Boston University
25 Buick Street
Boston, MA 02215
Attention: Vice President for
Business Affairs

with copies to:

Office of the General Counsel
Boston University
125 Bay State Road
Boston, MA 02215
Attention: Real Estate Counsel

Melvin R. Shuman, Esq.
Hale and Dorr
60 State Street
Boston, MA 02109

Authority:

Boston Redevelopment Authority
One City Hall Square
Boston, MA 02201
Attention: Director

with a copy to:

Boston Redevelopment Authority
One City Hall Square
Boston, MA 02201
Attention: Chief General Counsel

IN WITNESS WHEREOF, the parties hereto have caused this instrument to be executed in their behalf by their respective officers thereunto duly authorized as of the day and year first above set forth.

Approved as to form:

____

BOSTON REDEVELOPMENT AUTHORITY

By: ____________________________
Paul L. Barrett, Director

TRUSTEES OF BOSTON UNIVERSITY

By: ____________________________

Attachments:

Exhibit A: Legal Description
Exhibit B: Vote
Exhibit C: Development Plan
Exhibit D: Schedule of Schematic Design Drawings for the Site
Exhibit E: Intentionally Omitted
Exhibit F: Scoping Determination
EXHIBIT G: Development Review Procedures

EXHIBIT A
to Cooperation Agreement

(exhibit begins on next page)

A parcel of land, in Boston, Suffolk County, Massachusetts, shown on a plan entitled "Topographic Site Plan Boston University 587-599 Commonwealth Avenue Boston, Mass", dated January 6, 1992, revised February 11, 1992, October 29, 1992, March 23, 1993 and April 27, 1993, prepared by Harry R. Feldman, Inc., bounded and described according to said plan as follows:

SOUTHERLY	by Commonwealth Avenue, 341.50 feet;
WESTERLY	by Sherborn Street, 142.00 feet;
NORTHERLY	by the center line of a Private Alley, 341.42 feet; and
EASTERLY	by land now or formerly of Louis Puro, Trustee, 141.00 feet.

Containing 49,686 square feet according to said plan.

EXHIBIT B
to Cooperation Agreement

(exhibit begins on next page)

EXHIBIT C
to Cooperation Agreement

(exhibit begins on next page)

EXHIBIT D
to Cooperation Agreement

(exhibit begins on next page)

EXHIBIT E
to Cooperation Agreement

(exhibit begins on next page)

EXHIBIT F
to Cooperation Agreement

(exhibit begins on next page)

EXHIBIT G
to Cooperation Agreement

(exhibit begins on next page)

dip0728
Blacklined v. dip0623

DEVELOPMENT IMPACT PROJECT AGREEMENT
INCLUDING PROVISIONS FOR THE JOBS CONTRIBUTION GRANT
FOR
PLANNED DEVELOPMENT AREA NO. 43
595 COMMONWEALTH AVENUE

THIS DEVELOPMENT IMPACT PROJECT AGREEMENT is made as of _______________, 1993 between the BOSTON REDEVELOPMENT AUTHORITY (hereinafter the "Authority"), a public body politic and corporate created pursuant to Chapter 121B of the Massachusetts General Laws, as amended, having a principal place of business of One City Hall Square, Boston, Massachusetts 02201, and the TRUSTEES OF BOSTON UNIVERSITY, an educational, non-profit corporation whose principal business address is 25 Buick Street, Boston, Massachusetts 02215 Attn: Vice President for Business Affairs (hereinafter the "Applicant"). The Authority and the Applicant, collectively, shall be referred to herein as the "Parties."

WITNESSETH

WHEREAS, the Applicant wishes to undertake the development of a certain parcel of land in the City of Boston known as 595 Commonwealth Avenue and more particularly described in Exhibit A (the "Site");

WHEREAS, the Applicant submitted a Development Plan and Development Impact Project Plan (the "Development Plan") for approval by the BRA Board, which contemplates the construction of the following on the Site (a) a new building consisting of approximately 321,700 gross square feet, of nine (9) stories in height for the Boston University School of Management (the "Building") and (b) a three (3) level parking facility located below the grade of Commonwealth Avenue below the nine (9) story new building (the "Parking Facility"; together the Building and the Parking Facility are referred to as the "Development");

WHEREAS, the Development Plan was approved by the Authority on /\ **June 24,** 1993 (the "Vote"), after a public hearing at its meeting held on June 10, 1993, notice of which hearing was published in *The Boston Herald* on June 1, 1993 and June 4, 1993, a certified copy of which Vote is attached hereto as *Exhibit B*;

WHEREAS, the Development is proposed to include educational and other institutional uses, eating places, office uses, parking and uses ancillary, accessory, incidental and/or auxiliary to any of the foregoing uses, including roadways and pedestrian areas for access through the Site;

WHEREAS, the Development constitutes a Development Impact Project as defined in Section 26A-2(1) of Article 26A of the Boston Zoning Code and Section 26B-2(1) of Article 26B of the Boston Zoning Code;

WHEREAS, the Neighborhood Housing Trust (the "Neighborhood Housing Trust") as referred to in Article 26A of the Boston Zoning Code has been created under the authority of Chapter 371 of the Acts of 1987 and the laws of the Commonwealth of Massachusetts and administered pursuant to a Declaration of Trust dated November 19, 1985 and pursuant to an Ordinance Establishing the Neighborhood Housing Trust passed by the Boston City Council on May 21, 1986 and approved by the Mayor of Boston on July 6, 1986; and

WHEREAS, the Neighborhood Jobs Trust (the "Neighborhood Jobs Trust") as referred to in Article 26B of the Boston Zoning Code has been created under the authority of Chapter 371 of the Acts of 1987 and the laws of the Commonwealth of Massachusetts and administered pursuant to a Declaration of Trust dated November 19, 1985 and pursuant to an Ordinance Establishing The Neighborhood Jobs Trust passed by the Boston City Council on August 19, 1987 and approved by the Mayor of Boston on September 8, 1987.

NOW, THEREFORE, in consideration of the mutual covenants and agreements herein contained, the parties hereto agree as follows:

ARTICLE 1. DEVELOPMENT IMPACT PROJECT PLAN

1.1 Development Plan and Development Impact Project Plan. The parties hereby acknowledge that the Applicant submitted to the Authority a Development Plan and Development Impact Project Plan for the Site, a copy of which is attached hereto as Exhibit C and hereby incorporated by reference (the "Development Plan"), that the Development Plan includes a Development Impact Project Plan as required by Section 26A-3 of Article 26A and Section 26B-3 of Article 26B of the Boston Zoning Code and that after a public hearing held on June 10, 1993, notice of which was published in The Boston Herald on June 1, 1993 and June 4, 1993, the Authority approved the Development Plan on /\ June 24, 1993 pursuant to and in accordance with the Boston Zoning Code. Subject to the provisions of the Cooperation Agreement between the Parties of even date herewith, it is understood and agreed to by the Parties that no development of the Site will be undertaken except in accordance with the Development Plan approved by the Authority and the Boston Zoning Commission.

ARTICLE 2. HOUSING LINKAGE PAYMENT

2.1 Housing Linkage Payment. The Applicant shall be responsible, in accordance with the terms of this Agreement, for a Development Impact Project Contribution (hereinafter "Housing Linkage Payment"), as such term is defined in Section 26A-2(3) of the Boston Zoning Code, in an amount calculated in accordance with Paragraph 2.5 of this Agreement. Subject to the provisions of this Agreement, the Applicant may, at its option, satisfy its obligation for the Housing Linkage Payment, in whole or in part, by contributing to the creation of housing units for occupancy exclusively by low and moderate income residents of the City of Boston, as described in Paragraph 2.2 of this Agreement (hereinafter "Housing Creation Option"), or by payments made in accordance with Paragraph 2.3 of this Agreement (hereinafter "Housing Payment Option"), or by a combination of both the Housing Creation Option and the Housing Payment Option.

2.2 Housing Creation Option. If the Applicant shall elect to create or contribute to the creation of housing units for occupancy exclusively by low and moderate income residents of the City of Boston in order to satisfy its obligation for all or a part of the Housing Linkage Payments, the Applicant shall submit a proposal in writing to the Authority on or before the Housing Linkage Payment Date (as defined in Paragraph 2.7 of this Agreement). Such proposal, if approved in accordance with the Housing Creation Regulations dated April 17, 1986, adopted by the Authority pursuant to Section 26A-2(3)(a) of Article 26A of the Boston Zoning Code (the "Housing Creation Regulations") and performed by the Applicant, shall satisfy the provisions of Section 26A-2(3)(a) of Article 26A of the Boston Zoning Code. The proposal shall include a description of the number, location, cost and design of the housing units. In the event that the Applicant elects the Housing Creation Option, the Applicant pledges compliance with the Housing Creation Regulations. The proposal shall be subject to approval by the Authority after public notice and hearing.

2.3 Housing Payment Option.

(a) Housing Linkage Payment Under Housing Payment Option. If the Authority shall not have approved the Applicant's election of the Housing Creation Option as set forth in Paragraph 2.2 of this Agreement on or before the Housing Linkage Payment Date or if the Applicant shall elect to contribute money payments in order to satisfy its obligation for all or a part of the Housing Linkage Payment for the Development, said payments shall be made to the Collector-Treasurer of the City of Boston (the "Collector-Treasurer"), Room M-5, One City Hall Square, Boston, Massachusetts 02201, as managing trustee of the Neighborhood Housing Trust. Payments shall be made in twelve (12) equal annual installments. The Authority hereby agrees that delivery of such payments to the Collector-Treasurer constitutes full satisfaction of the Applicant's obligation to make the Housing Linkage Payments. The first installment of such payments shall be due and payable on the Housing Linkage Payment Date as defined in Paragraph 2.7 of this Agreement, and subsequent installments shall be due and payable without interest on the following eleven (11) anniversary dates of the Housing Linkage Payment Date.

(b) Amount of Housing Payment Option. The Housing Linkage Payment shall be in an amount calculated in accordance with the provisions of Paragraph 2.5 of this Agreement.

(c) Late Payment. In the event any installment of the Housing Linkage Payment is not made in a timely manner as provided herein, the Applicant shall pay interest thereon at the rate of 1.5% per month, commencing on the applicable date when payment should have been received by the Collector-Treasurer and ending on the date when the Collector-Treasurer receives payment.

(d) Letter of Credit. If the Applicant satisfies its obligation to make the Housing Linkage Payment by fulfilling the Housing Payment Option or a combination which includes the Housing Payment Option, or has not secured the Authority's approval of its proposal for housing creation by the Housing Payment Date, the Applicant shall deliver to the Authority by or on the Housing Linkage Payment Date an assignable letter (or letters) of credit for the benefit of the Neighborhood Housing Trust (the "Letter of

Credit") in an amount equal to (x) the total Housing Linkage Payment due, less (y) the amount of the first annual installment paid by or on the Housing Linkage Payment Date.

(i) The Letter of Credit shall remain in full force and effect until the entire Housing Linkage Payment shall have been paid (it being agreed and understood that the Letter of Credit may, subject to the terms hereof, have an expiration date earlier than the expiration of the twelve-year period during which the Applicant's obligations under the Housing Payment Option would remain outstanding, so long as such Letter of Credit authorizes the Authority to draw upon it if not replaced, extended or renewed at least thirty (30) days prior to its expiration date). The Letter of Credit shall be for a period of not less than one (1) year. In the event that any installment due hereunder remains outstanding as of the date thirty (30) days before the expiration of such Letter of Credit, such Letter of Credit shall, at least thirty (30) days before such expiration, be renewed, extended or replaced with a substitute Letter of Credit with a term of not less than one (1) year.

(ii) The Letter of Credit shall provide that it is payable upon presentation to the issuer of a certified statement by the Director of the Authority or by the Collector-Treasurer stating that (A) a payment obligation secured by the Letter of Credit has not been timely satisfied or (B) the Letter of Credit, as the same may have been renewed, extended or replaced, has not been renewed, extended or replaced (or further renewed, extended or replaced as the case may be) prior to thirty (30) days before its expiration, as required by the terms of this Agreement.

(iii) The Applicant may, by tendering evidence of the receipt by the Collector-Treasurer of an installment of the Housing Linkage Payment (other than the initial installment), reduce the amount of the Letter of Credit by the amount of such payment. In connection with the foregoing, the Authority agrees to take all actions which may be necessary or appropriate to enable the Applicant to implement such reduction, including without limitation providing its written consent to any amendment to the Letter of Credit or exchanging the Letter of Credit for one or more substitute letters of credit having the reduced principal amount.

2.4 Conversion to Housing Creation Option After Housing Payment Date. If the Applicant is making its Housing Linkage Payment on the installment basis under the Housing Payment Option after the Housing Linkage Payment Date but before having paid all of the installments due thereunder and the Applicant desires to elect the Housing Creation Option, the Applicant shall submit a housing creation proposal in writing to the Authority. Such proposal, if approved by the Authority and performed by the Applicant, shall satisfy the obligation of the Applicant to make any remaining installments due under the Housing Payment Option.

Notwithstanding the foregoing, in the event that the Neighborhood Housing Trust and/or the Authority shall have assigned and conveyed all of its right, title and interest in and to any of the remaining annual installments of the Housing Linkage Payment payable by the Applicant in accordance with Paragraph 2.12 hereof, the Applicant shall not have the right to convert to the Housing Creation Option in accordance with this Paragraph 2.4.

2.5 Calculation of Housing Linkage Payment. The parties hereby acknowledge that the Development will include certain uses enumerated in Table D of Article 26A of the Boston Zoning Code as in existence on the date hereof (hereinafter "Table D Uses"), including, without limitation, Use No. 16A under the Boston Zoning Code and other institutional and educational uses, as more particularly set forth in the Development Plan, and that the construction of the Development will require certain exceptions to the Boston Zoning Code. It is anticipated that the gross floor area (calculated pursuant to Section 2-1(21) of the Boston Zoning Code) of the Development devoted to one or more of such Table D Uses in the aggregate will exceed one hundred thousand (100,000) square feet. It is anticipated that the Development will include approximately 321,700 gross square feet dedicated to Table D Uses, which area is calculated in accordance with the definition of gross floor area contained in Section 2-1(21) of the Boston Zoning Code, based on schematic drawings of the Development. It is anticipated that the total amount of the Housing Linkage Payment referred to in Paragraph 2.1 of this Agreement, calculated at the rate of $5.00 for each square foot of gross floor area in excess of one hundred thousand (100,000) square feet devoted to one or more Table D Uses will approximate a total of $1,108,500.00. The parties acknowledge that the amount of the Housing Linkage Payment is based upon gross floor areas as estimated in the Development Plan. Prior to the issuance of a Certificate of Occupancy, the

Applicant shall submit a statement of the final gross floor area for the Development as certified by the architect for the Development in accordance with Section 2-1(21) of the Boston Zoning Code. In calculating the amount of Housing Linkage Payment, all parking uses shall not be considered "ancillary or accessory to the uses listed in Table D" within the meaning of Section 26A-3(2)(a) of the Boston Zoning Code and thus shall not be included in the calculation of gross floor area subject to Housing Linkage Payments. If the actual gross floor area of the Development, as defined in Section 2-1(21) of Article 2 of the Boston Zoning Code and as certified by the architect for the Development, differs from the above-stated estimate, the Applicant shall adjust the amount of the Housing Linkage Payment for the Development in accordance with Article 26A of the Boston Zoning Code to reflect the change in gross floor area, provided that if the adjustment reduces the Housing Linkage Payment, the adjustment as to any Housing Linkage Payment already paid shall be in the form of a credit against future Housing Linkage Payment obligations of the Applicant, if any.

2.6 Recalculation. The Authority hereby agrees that, subject to the final calculation provisions contained in Paragraph 2.5 of this Agreement, any change in the formula (amount or rate of payment) for the calculation of the Housing Linkage Payment as set forth in Section 26A-3(2) of Article 26A of the Boston Zoning

Code and otherwise, or any change in the definition of "gross floor area" in Section 2-1(21) of Article 2 of the Boston Zoning Code, or any other changes in the Boston Zoning Code after the date hereof, shall not in any way increase the Housing Linkage Payment determined in accordance with Paragraph 2.5 of this Agreement nor decrease the period over which Housing Linkage Payments are to be made.

2.7 Housing Linkage Payment Date. The Housing Linkage Payment Date shall be the earlier of (i) the date of the issuance of the initial Certificate of Occupancy for the Development or (ii) the date twenty-four (24) months after the granting of the initial building permit for the Development. For purposes of this Agreement, the "initial building permit for the Development" shall be deemed to refer to the first building permit issued in connection with the construction of the Development described in the Development Plan (including, by way of example but not of limitation, any foundation work undertaken in connection therewith), and shall not refer to any building or other permits or approvals issued in connection with the excavation of the site or demolition of any structures (or portions thereof) now existing on the Site, or the conducting of borings, soil investigations or other similar activities.

2.8 Notice of Agreement. Upon execution of this Agreement, the Authority will notify the Collector-Treasurer of such execution. The Authority shall review the Applicant's determination of the final gross floor area of the Development. If the Authority confirms the Applicant's determination, it shall so certify and forward the same to the Inspectional Services Department of the City of Boston ("ISD") with a copy to the Collector-Treasurer.

2.9 Development Address. In order to assist the Collector-Treasurer in coordinating collection efforts with ISD, the Applicant shall submit to the Authority and the Neighborhood Housing Trust the Development address as listed on the building permit application and the building application numbers.

2.10 Non-Accrual of Housing Linkage Payment. If a building permit is not granted for the Development or part thereof, or if construction of the Development or part thereof is abandoned after a building permit is obtained and prior to the commencement of substantial construction (the commencement of foundation work shall constitute commencement of substantial construction), or if a building permit for the Development or part thereof is revoked or lapses and is not renewed, then the Applicant shall have no responsibility for the Housing Linkage Payment with respect to the portions of the Development not constructed.

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2.11 Credit Towards Housing Linkage Payment. If the City of Boston should hereafter impose, assess, or levy any excise or tax upon the Development, the proceeds of which are dedicated, in whole or in part, to the establishment of a fund for the purposes substantially the same as the purposes recited in Section 26A-1 of Article 26A of the Boston Zoning Code, amounts payable hereunder by the Applicant shall be credited against such excise or tax; provided, however, that if such crediting shall not be legally permissible to satisfy payment of such tax or excise, the obligations of the Applicant hereunder shall, to the extent of the amount of such tax or excise, thereupon cease and be of no further force and effect.

2.12 Assignment of Housing Linkage Payment. The Applicant and the Authority acknowledge and agree that the Neighborhood Housing Trust and/or the Authority may, at any time while any obligations of the Applicant under Article 26A of the Code remain outstanding, and subject only to the final two sentences of this /\ **Paragraph** 2.12, assign and convey all of its right, title and interest in and to any of the then remaining annual installments of the Housing Linkage Payment payable by the Applicant. In the event that the Neighborhood Housing Trust and/or the Authority assigns and conveys all of its right, title and interest in and to any of the remaining annual installments of the Housing Linkage Payment, the Parties hereto agree to execute any documents reasonably required by the assignee to evidence such assignment, and thereafter the Applicant shall pay the assigned annual installments of the Housing Linkage Payment to the assignee. The Neighborhood Housing Trust and the Authority shall deliver to the Applicant a statement, in recordable form, acknowledging that upon payment of all of the assigned annual installments of the Housing Linkage Payment to such assignee, the Applicant shall have satisfied its obligations under Article 26A of the Boston Zoning Code to make the Housing Linkage Payment and shall have no further obligation to either the Authority or the Neighborhood Housing Trust (or, if less than all of the then remaining annual installments shall have been so assigned, setting forth the total amount of the Applicant's obligations to make the Housing Linkage Payment that will remain outstanding after such payment shall have been made to the assignee). The Authority and the Neighborhood Housing Trust shall deliver such statement to the Applicant with the notice of any assignment hereunder.

ARTICLE 3. JOBS CONTRIBUTION GRANT

3.1 Jobs Linkage Payment. The Applicant shall be responsible, in accordance with this Agreement, for a Jobs Contribution Grant (hereinafter "Jobs Linkage Payment"), as such term is defined in Section 26B-2(3) of Article 26B of the Boston Zoning Code, in the amount as calculated in accordance with Paragraph 3.4 of this Agreement. The Applicant may, at its option, satisfy its obligation for the Jobs Linkage Payment, in whole or in part, by contributing to the creation of a jobs training program for workers who will be employed on a permanent basis by the Applicant, as described in Paragraph 3.2 of this Agreement (hereinafter, "Jobs Creation Option"), or by payment made in accordance with Paragraph 3.3 of this Agreement (hereinafter, "Jobs Payment Option"), or by a combination of both the Jobs Creation Option and the Jobs Payment Option.

3.2 Jobs Creation Option. If the Applicant shall elect to create or contribute to the creation of a jobs training program for workers who will be employed on a permanent basis by the Applicant to satisfy its obligation for all or a part of the Jobs Linkage Payment, then the Applicant shall submit a proposal in writing to the Neighborhood Jobs Trust on or before the Jobs Linkage Payment Date (as defined in Paragraph 3.6 hereof). Such proposal, approved by the Neighborhood Jobs Trust on or before the

Jobs Linkage Payment Date, as set forth in Paragraph 3.6 below, and if subsequently duly performed in accordance with its terms, shall satisfy the provisions of Section 26B-2(3)(c) of Article 26B of the Boston Zoning Code. In the event that the Applicant elects the Jobs Creation Option, the Applicant pledges compliance with the Jobs Creation Regulations. The proposal shall be subject to the approval of the Neighborhood Jobs Trust after public notice and hearing.

3.3 Jobs Payment Option. If the Applicant shall elect to contribute money payments in order to satisfy its obligation for all or a part of the Jobs Linkage Payment, or if the Neighborhood Jobs Trust shall not have approved a Jobs Creation Proposal on or before the Jobs Linkage Payment Date, the Applicant shall pay the Jobs Linkage Payment in two equal annual installments. The first installment of the Jobs Linkage Payment shall be due and payable on the Jobs Linkage Payment Date (defined in Paragraph 3.6 hereof) and the second installment shall be due and payable on the one year anniversary of such Jobs Linkage Payment Date. Said payments shall be made to the Collector-Treasurer, Room M-5, One City Hall Square, Boston, Massachusetts, as managing trustee of the Neighborhood Jobs Trust. The Authority hereby agrees that delivery of such payments to the Collector-Treasurer constitutes full satisfaction of the Applicant's obligation to make the Jobs Linkage Payments.

3.4 Calculation of Jobs Linkage Payments. The parties hereby acknowledge that the Development will include certain uses enumerated in Table E of Section 26B-3 of Article 26B of the Boston Zoning Code as in existence on the date hereof (hereinafter "Table E Uses"), including, without limitation, Use No. 16A under the Boston Zoning Code and other institutional and educational uses, as more particularly set forth in the Development Plan. It is anticipated that the gross floor area (calculated pursuant to Section 2-1(21) of the Boston Zoning Code) of the Development devoted to one or more of such Table E Uses in the aggregate will exceed one hundred thousand (100,000) square feet. It is anticipated that the Development will include approximately 321,700 gross square feet dedicated to Table E Uses, which area is calculated in accordance with the definition of gross floor area contained in Section 2-1(21) of the Boston Zoning Code, based on schematic drawings of the Development. It is anticipated that the total amount of the Jobs Linkage Payment referred to in Paragraph 3.1 of this Agreement, calculated at the rate of $1.00 for each square foot of gross floor area in excess of one hundred thousand (100,000) square feet devoted to one or more Table E Uses will approximate a total of $221,700. The parties acknowledge that the amount of the Jobs Linkage Payment is based upon gross floor areas as estimated in the Development Plan. In calculating the Jobs Linkage Payments, all parking uses shall not be considered "accessory to the uses listed in Table E" within the meaning of Section 26B-3(1)(a) of the Boston Zoning Code and thus shall not be included in the calculation of gross floor area subject to Jobs Linkage Payments. If the actual gross floor area of the Development, as defined in Section 2-1(21) of Article 2 of the Boston Zoning Code and as certified by the architect for the Development differs from the above-stated estimate, the Applicant shall adjust the amount of the Jobs Linkage Payment for the Development in accordance with Article 26B of the Boston Zoning Code to reflect the change in gross floor area, provided that if the adjustment reduces the Jobs Linkage Payment, the adjustment as to any Jobs Linkage Payment already paid shall be in the form of a credit against future Jobs Linkage Payment obligations of the Applicant, if any.

3.5 Recalculation. The Authority hereby agrees that, subject to the final calculation provisions contained in Paragraph 3.4 of this Agreement, any change in the formula (amount or rate of payment) for the calculation of the Jobs Linkage Payment as set forth in Section 26B-3(1) of Article 26B of the Boston Zoning Code and otherwise, or any change in the definition of "gross floor area" in Section 2-1(21) of Article 2 of the Boston Zoning Code, or any other changes in the Boston Zoning Code after the date hereof, shall not in any way increase the Jobs Linkage Payment determined in accordance with Paragraph 3.4 of this Agreement nor decrease the period over which Jobs Linkage Payments are to be made.

3.6 Jobs Linkage Payment Date. The Jobs Linkage Payment shall be made in two (2) equal annual installments. The first installment of the Jobs Linkage Payment shall be due on the Jobs Linkage Payment Date which shall be the date of the issuance of the initial building permit for substantial construction of the Development. The remaining installment for the Jobs Linkage Payment shall be due and payable without interest on the first anniversary of the Jobs Linkage Payment Date.

3.7 Non-Accrual of Jobs Payment. If a building permit is not granted for the Development or part thereof, or if construction of the Development or part thereof is abandoned after a building permit is obtained and prior to the commencement of substantial construction (the commencement of foundation work shall constitute the commencement of substantial construction) or if a building permit for the Development or part thereof is revoked or lapses and is not renewed, then the Applicant shall have no responsibility for the Jobs Linkage Payment with respect to the portions of the Development not constructed.

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3.8 Credit Toward Jobs Linkage Payment. If the City of Boston should hereafter impose, assess, or levy any excise or tax upon the Development, the proceeds of which are dedicated, in whole or in part, to the establishment of a fund for the purposes substantially the same as the purposes recited in Section 26B-1 of Article 26B of the Boston Zoning Code, amounts payable hereunder by the Applicant shall be credited against such excise or tax; provided, however, that if such crediting shall not be legally permissible to satisfy payment of such tax or excise, the obligations of the Applicant hereunder shall, to the extent of the amount of such tax or excise, thereupon cease and be of no further force or effect.

ARTICLE 3A. BOSTON RESIDENTS CONSTRUCTION EMPLOYMENT PLAN

3A.1 Standards. The University will execute a Boston Residents Construction Employment Plan, consistent with the requirements of the Boston Residents Jobs Policy established by Chapter 30 of the Ordinances of 1983 and the Mayor's Executive Order Extending the Boston Residents Jobs Policy dated July 12, 1985, which sets forth in detail the University's plan to ensure that its general contractor, and those engaged by said general contractor for construction of the Project on a craft by craft basis, use good faith efforts to meet the following Boston Residents Construction Employment Standards: (1) at least 50% of the total employee worker hours in each trade shall be by bona fide Boston residents; (2) at least 25% of the total employee worker hours in each trade shall be by minorities; and (3) at least 10% of the total employee worker hours in each trade shall be by women. Said plan shall include provisions for monitoring, compliance and sanctions. Worker hours, as defined in said plan, may include, at the University's option, on-the-job training and apprenticeship positions.

ARTICLE 4. LIABILITY

4.1 Assignability. This Agreement shall be binding upon and enforceable against the successors and assigns of the parties hereto (other than mortgagees of the Site, or any part thereof, or those claiming through such mortgagees unless said party obtains title to the Site, or the applicable part thereof, and proceeds with the Development), it being understood and agreed that the Applicant shall have a right to transfer or assign to another party or parties its rights, interests and obligations under this Agreement and in all or a portion of the Site.

4.2 Severability. If any term or provision of this Agreement, or the application thereof to any person or circumstance, shall to any extent be invalid and unenforceable, the remainder of this Agreement, or the application of such terms to persons or circumstances other than those to which it is

invalid or unenforceable, shall not be affected thereby, and each term and provision of this Agreement shall be valid and shall be enforced to the extent permitted by law.

4.3 Scope of Applicant's Liability. Provided, in the event of sale or assignment, Applicant complies with the requirements of Paragraph 5.5 of this Agreement, the liability of the Applicant or its successors or assigns (including, without limitation, mortgagees) arising under this Agreement shall be limited solely to the Development and shall not apply to other assets and property of the Applicant.

However, from and after the delivery by the Applicant to the Authority of the letter or letters of credit described in /\ Paragraph 2.3(d) of this Agreement, the Authority shall look solely to the proceeds of such letter(s) of credit as security for the performance of the Housing Linkage Payment obligations of the Applicant hereunder. It being understood that the Authority shall thereafter look to no other interests of the Applicant, its successors or assigns including, without limitation, the Development or the right to the use and occupancy thereof, in the event of a breach by the Applicant of its Housing Linkage Payment obligations hereunder.

Notwithstanding the foregoing, failure to make a payment due under Article 2 or Article 3 shall be deemed a default hereunder. In the event of a default hereunder with respect to a Housing

Linkage Payment or Jobs Linkage Payment, the Authority may, in addition to any other remedies available, notify ISD to withhold issuance of Certificates of Occupancy until the default is cured. No holder of a mortgage on any or all of the buildings or portions of the Development or the Site, as the case may be, shall be liable to perform or be liable in damages for the obligations of the Applicant hereunder unless and until such holder acquires title to the applicable building or portion of the Development or the Site and proceeds with the Development.

4.4 Personal Liability. No partner, venturer, trustee, beneficiary, shareholder, officer, director or the like of the Applicant or its successors or assigns, from time to time, or any such person's or entity's separate assets or property shall have or be subject to any personal liability with respect to any obligation or liability of the Applicant or its successors or assigns.

ARTICLE 5. MISCELLANEOUS PROVISIONS

5.1 Amendments; Law to be Applied. If the parties hereto agree hereafter to amend this Agreement, such amendment shall be in writing and executed by the parties hereto. This Agreement shall be governed by the laws of the Commonwealth of Massachusetts, and sets forth the entire agreement between the Parties. This Agreement is binding and enforceable under contract law upon, and inures to the benefit of, the Parties, their successors, assigns, and legal representatives, with respect to the Development or any part thereof, including, without limitation, any successor owner or owners of the Development or any part thereof, and the Neighborhood Housing Trust and the Neighborhood Jobs Trust as third party beneficiaries. To the extent that any term or provision of this Agreement represents a contractual obligation that is also contained in any statute, ordinance, regulation or other law, such contractual obligation contained herein shall be invalid and unenforceable to the extent that such law or statute is deemed invalid or unenforceable or is inapplicable to the Development or the Building.

5.2 Capitalized Terms. The capitalized terms used herein without definition shall have the meanings ascribed in Article 2 or Article 26A or Article 26B of the Boston Zoning Code as in existence on the date hereof, unless otherwise provided.

5.3 Knowledge of Laws. The Applicant shall keep itself fully informed of all votes of the Authority, City ordinances, executive orders, and regulations, and state and federal law which in any manner affect the provisions of this Agreement. The Applicant shall at all times observe and comply with said votes, ordinances, executive orders, regulations or laws, and the Applicant and its respective successors and assigns shall protect and indemnify the City of Boston and the Authority, its officer, agents and employees against any claim or liability arising from or based upon violations of such ordinances, executive orders, regulations or laws caused by any knowing or negligent act or omission of the Applicant and its respective successors and assigns, and their agents or employees.

5.4 Notice. All notices or other communications required or permitted to be given under this Agreement shall be in writing, signed by a duly authorized officer or representative of the Authority or the Applicant, as the case may be, and shall be either hand delivered or mailed postage pre-paid, by registered or certified mail, return receipt requested, and shall be deemed given when delivered, if by hand, or when deposited with the U.S. Postal Service, if mailed to the principal office of the party to which it is directed, which is as follows unless otherwise designated by written notice to the other party:

Authority:
Boston Redevelopment Authority
One City Hall Square
Boston, Massachusetts 02201
Attn: Director

with copies to:
Boston Redevelopment Authority
One City Hall Square
Boston, Massachusetts 02201
Attn: Chief General Counsel

Applicant:
Trustees of Boston University
25 Buick Street
Boston, Massachusetts 02215
Attn: Vice President for
Business Affairs

with copies to:

Office of the General Counsel
125 Bay State Road
Boston, Massachusetts 02215
Attn: Real Estate Department

Melvin R. Shuman, Esq.
Hale and Dorr
60 State Street
Boston, MA 02109

5.5 Notice of Agreement upon Sale or Assignment. Prior to the sale or assignment of its interest in the Development, the Applicant shall comply with the following conditions: a) the Applicant shall not be in default of the terms and conditions of this Agreement imposed upon Applicant to such date; b) the successor or assignee shall expressly assume and agree to perform and comply with all the covenants and provisions of this Agreement on the part of the Applicant; and c) there shall be promptly delivered to the Authority the original or a duplicate original of the instrument or instruments containing such assignment to and assumption by the successor or assignee. Failure of the Applicant to give such notice prior to the sale or assignment of its interest in the Development shall render ineffective certain provisions contained in Article 4 hereof as set forth therein. Any holder of a mortgage on the Development shall expressly assume and agree to perform any obligations of the Applicant hereunder upon acquisition of title to the Development if it proceeds with the Development.

5.6 Recording. The Applicant shall, if permitted, record at the Suffolk County Registry of Deeds (the "Registry"), a notice of this Agreement promptly after the execution thereof by all parties. If the Applicant fails promptly to record such notice, the Authority shall have the right, upon notice to the Applicant, to cause such notice to be recorded in the Registry.

5.7 Certification of Compliance. To the extent applicable, the Authority hereby agrees to assist the Applicant in obtaining from the Collector-Treasurer, upon satisfaction by the Applicant of its obligations for the Housing Linkage Payment or the Jobs Linkage Payment, as the case may be, with respect to the Development and within ten (10) business days after request by the Applicant, a certification in recordable form, that (i) said Housing Linkage Payment or Jobs Linkage Payment, or both, as the case may be, have been satisfied by the Applicant and that the Applicant has no further liability for such Housing Linkage Payment /\ or Jobs Linkage Payment or (ii) said Housing Linkage Payment or Jobs Linkage Payment, or both, as the case may be, have been paid to date.

5.8 Satisfaction of Development Impact Project Requirements. The Authority hereby acknowledges that by executing this Agreement, the Applicant has satisfied the requirements of Section 26A-3(2) of Article 26A and Section 26B-3(1) of

Article 26B of the Boston Zoning Code insofar as satisfaction of the requirements of those Sections are a precondition to the granting, allowing, or adopting of a variance, conditional use permit, exception, or zoning map or text amendment with respect to the Applicant's development of the Site.

5.9 Applicability of Obligations. The /\ Parties understand and agree that (i) in entering into this Agreement, the Applicant is not conceding that future project(s) that the Applicant may undertake on other property owned or controlled by the Applicant are or will be subject to Housing Linkage Payments and Jobs Linkage Payments and (ii) any such future project(s) will not be deemed to be an extension or part of the Development.

5.10 Titles. The captions of this Agreement, its articles and paragraphs throughout this document are intended solely to facilitate reading and referencing its provisions. Such captions shall not affect the meaning or interpretation of this Agreement.

5.11 Severability. If any term or provision of this Agreement, or the application thereof to any person or circumstance, shall to any extent be invalid and unenforceable, the remainder of this Agreement, or the application of such terms to persons or circumstances other than those to which it is invalid or unenforceable, shall not be affected thereby, and each term and provision of this Agreement shall be valid and shall be enforced to the extent permitted by law.

5.12 Transfer of Interest. Rights and interests accorded by this Agreement shall not be assigned, delegated, subcontracted or in any way transferred by the Applicant without prior written notice to the Authority.

IN WITNESS WHEREOF the /\ Parties hereto have caused this instrument to be executed in their behalf by their respective officers thereunto duly authorized as of the day and year first above set forth.

Approved as to Form:

____
Chief General Counsel
Boston Redevelopment Authority

BOSTON REDEVELOPMENT AUTHORITY

By____________________________
Paul L. Barrett, Director

TRUSTEES OF BOSTON UNIVERSITY

By____________________________

Attachments:

Exhibit A: Legal Description

Exhibit B: Vote

Exhibit C: Development Plan

EXHIBIT A

to Development Impact Project Agreement

(exhibit begins on next page)

A parcel of land, in Boston, Suffolk County, Massachusetts, shown on a plan entitled "Topographic Site Plan Boston University 587-599 Commonwealth Avenue Boston, Mass", dated January 6, 1992, revised February 11, 1992, October 29, 1992, March 23, 1993 and April 27, 1993, prepared by Harry R. Feldman, Inc., bounded and described according to said plan as follows:

SOUTHERLY	by Commonwealth Avenue, 341.50 feet;
WESTERLY	by Sherborn Street, 142.00 feet;
NORTHERLY	by the center line of a Private Alley, 341.42 feet; and
EASTERLY	by land now or formerly of Louis Puro, Trustee, 141.00 feet.

Containing 49,686 square feet according to said plan.

EXHIBIT B

to Development Impact Project Agreement

(exhibit begins on next page)

EXHIBIT C

to Development Impact Project Agreement

(exhibit begins on next page)

Map Amendment Application No. 359
Boston Redevelopment Authority in behalf
of Trustees of Boston University
Planned Development Area No. 43
"D" Designation at 595 Commonwealth
Avenue

TO THE ZONING COMMISSION OF THE CITY OF BOSTON:

The Boston Redevelopment Authority, acting under Section 3-1A of the Boston Zoning Code, petitions the Zoning Commission to approve the Development Plan for Planned Development Area No. 43, with due consideration of the findings of the Boston Redevelopment Authority adopted on June 24, 1993, and to amend "Map 1 Boston Proper," of the series of maps entitled "Zoning Districts City of Boston" as amended as established under Chapter 665 of the Acts of 1956 as amended, as follows:

By adding to the B-4 zoning designation of the land described below the suffix "D", indicating a Planned Development Area overlay district. Said land is bounded and described according to a plan entitled, "Topographic Site Plan Boston University, 587-599 Commonwealth Avenue Boston, Mass", dated January 6, 1992, revised February 11, 1992, October 29, 1992, March 23, 1993 and April 27, 1993, prepared by Harry R. Feldman, Inc. as follows:

Beginning at a point on the northerly side of Commonwealth Avenue at the southeasterly corner of said parcel as shown on said plan, thence running

NORTH 80° 45' 13" W	by Commonwealth Avenue for a distance of three hundred and forty-one and 50/100 (341.50) feet; thence turning and running
NORTH 09° 15' 47" E	for a distance of one hundred forty-two (142) feet; thence turning and running
SOUTH 81° 54' 40" E	for a distance of three hundred forty-one and 42/100 (341.42) feet; thence turning and running
SOUTH 59° 15' 47" W	for a distance of one hundred forty-nine (149) feet to point of beginning;

Containing approximately 49,686 square feet more or less, according to said plan.

SNPZ/53.RPT
081093/1

Petitioner: Boston Redevelopment Authority

By: Paul L. Barrett

Paul L. Barrett, Director

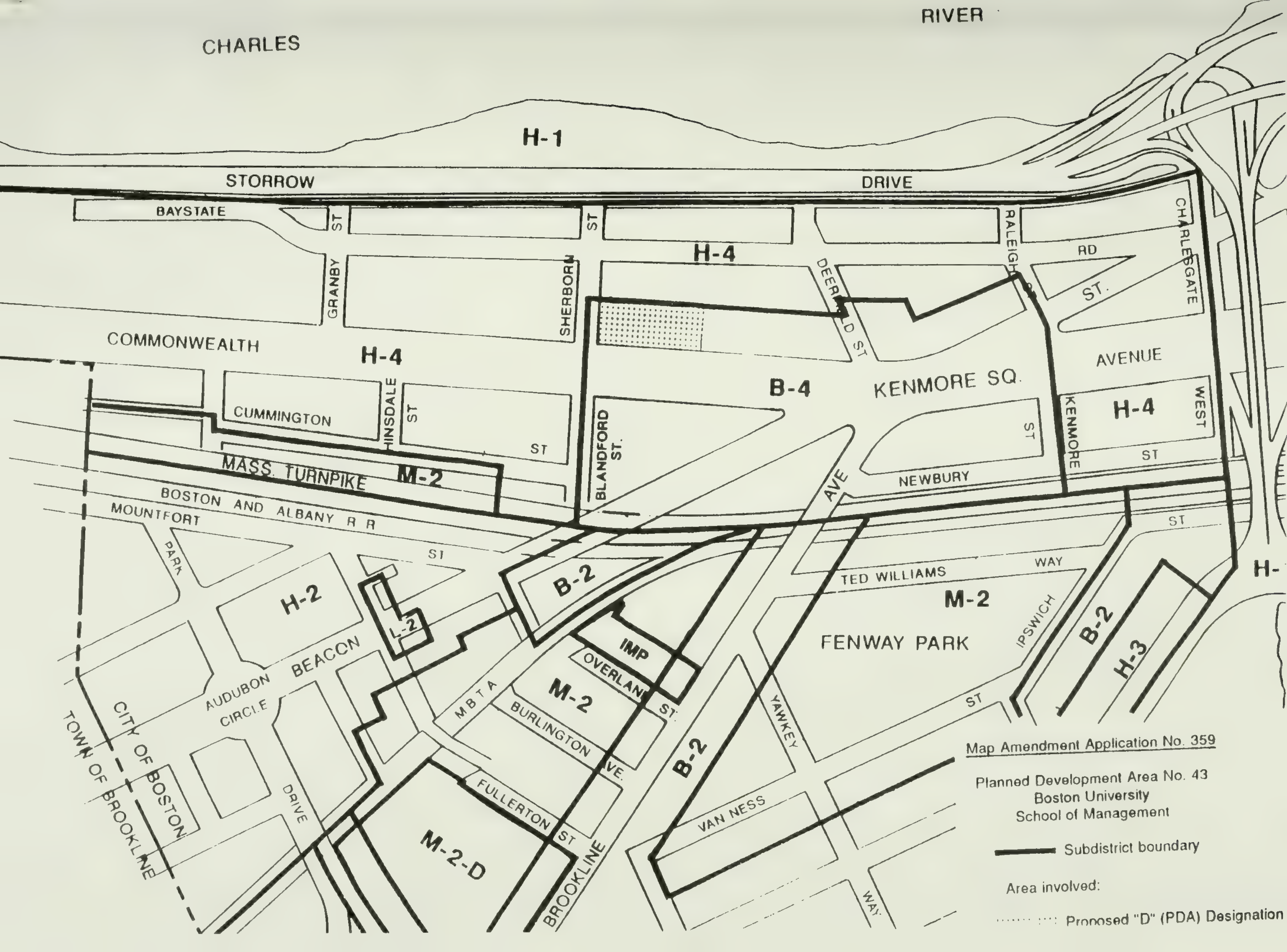
Address: City Hall / 9th Floor

Boston, MA 02201-1007

Tel No.: 722-4300, ext. 4357

Date: [illegible]

as authorized by BRA Board on
June 24, 1993



Map Amendment Application No. 359

Planned Development Area No. 43
Boston University
School of Management

Subdistrict boundary

Area involved:

Proposed "D" (PDA) Designation

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